



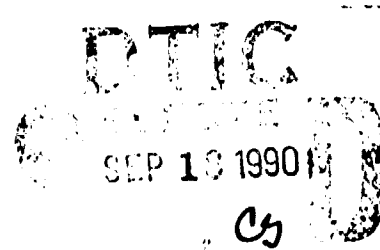
DTIC FILE COPY

US Army Corps
of Engineers

DTIC FILE COPY

PROPOSED
MANEUVER DAMAGES

AD-A226 657



Mon

L. Jean O'M

Wat
3909 H

TECHNICAL REPORT GL-90-13

PROPOSED 9TH INFANTRY DIVISION FORCE CONVERSION
DAMAGE, EROSION, AND NATURAL RESOURCES ASSESSMENT
FORT LEWIS, WASHINGTON

Volume II: PLATES

by

Monte L. Pearson, Patricia A. Morris, Robert J. Larson

Geotechnical Laboratory

and

L. Jean O'Neil, Michael R. Waring, H. Glenn Hughes, Mary C. Landin

Environmental Laboratory

DEPARTMENT OF THE ARMY

Waterways Experiment Station, Corps of Engineers
3909 Halls Ferry Road, Vicksburg, Mississippi 39180-6199



2

CONVERSION; SOURCES ASSESSMENT

Larson

y C. Landin

neers
0180-6199

by

Monte L. Pearson, Patricia A. Morris, Robert J. Larsen

Geotechnical Laboratory

and

L. Jean O'Neil, Michael R. Waring, H. Glenn Hughes, Mary C. L.

Environmental Laboratory

DEPARTMENT OF THE ARMY

Waterways Experiment Station, Corps of Engineers
3909 Halls Ferry Road, Vicksburg, Mississippi 39180-6



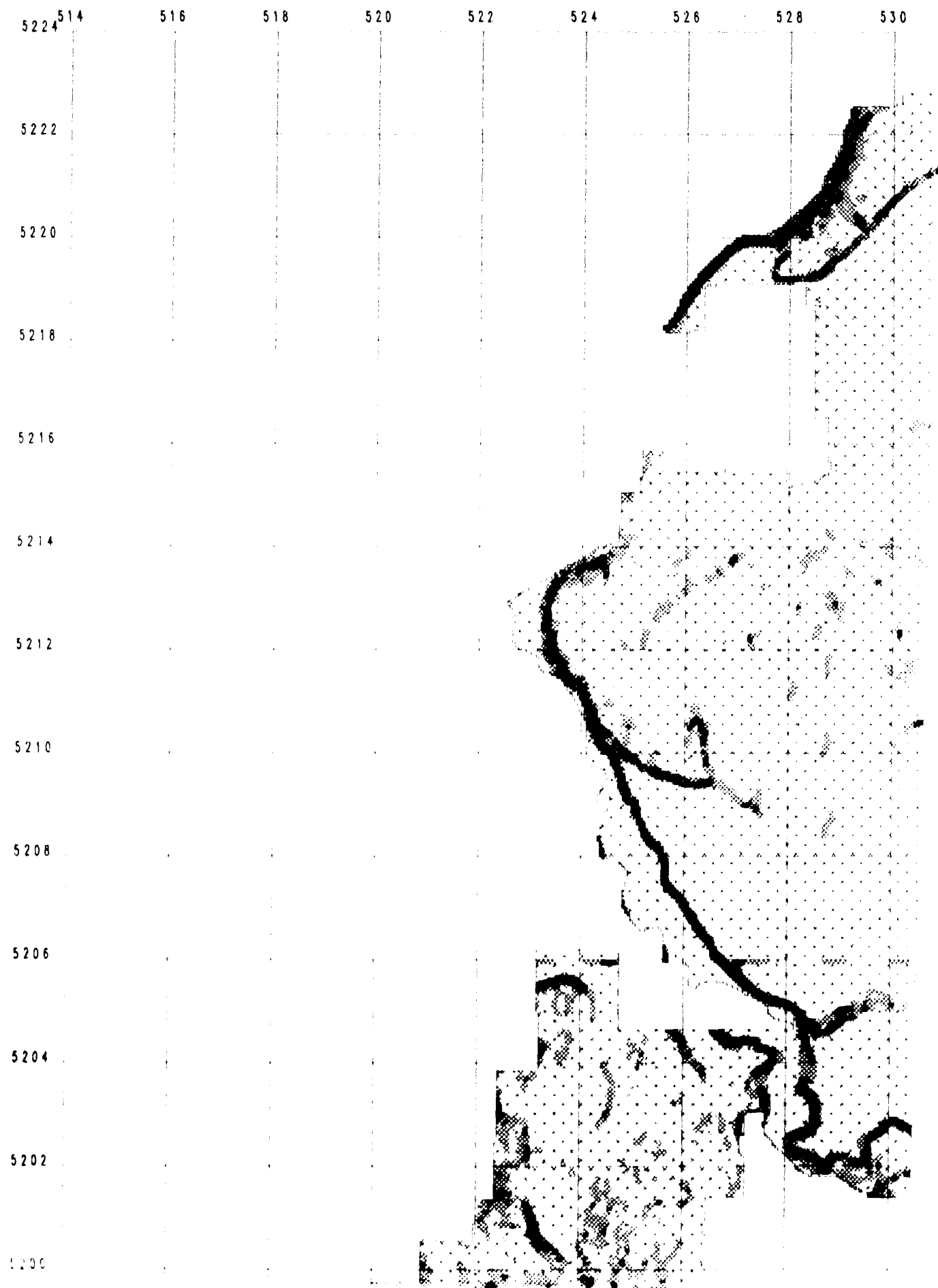
August 1990

Final Report

Approved For Public Release; Distribution Unlimited

Prepared for DEPARTMENT OF THE ARMY
US Army Engineer District, Seattle
Seattle, Washington 98124-2255

90 09 18 209



528

530

532

534

536

538

540

542

544

546

548

52

52

52

52

52

52

52

52

52

52

52

52

52

548

5224

5222

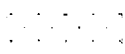
5220



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SLOPE %

SCALE 1:100000



0-10

5216



>10-20

5214



>20

5212

FT LEWIS, WASHINGTON

5210

5208

5206

5204

5202

5200

NOTED	
EPR	
Unrevised	
Justification	
By	
Distribution	
Availability Codes	
Dist	Avail and/or Special
A-1	



5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

5194

5192

514

516

518

520

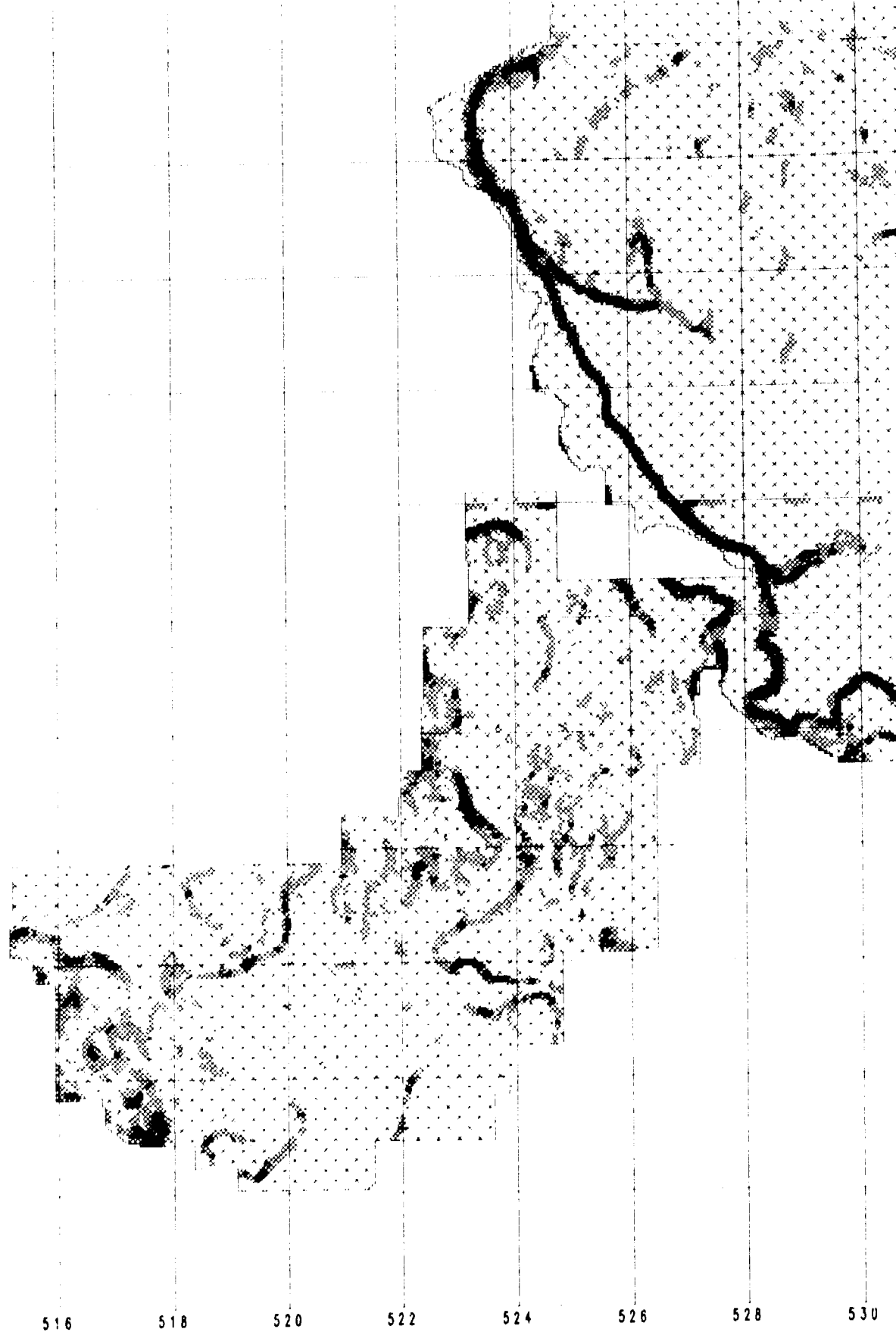
522

524

526

528

530



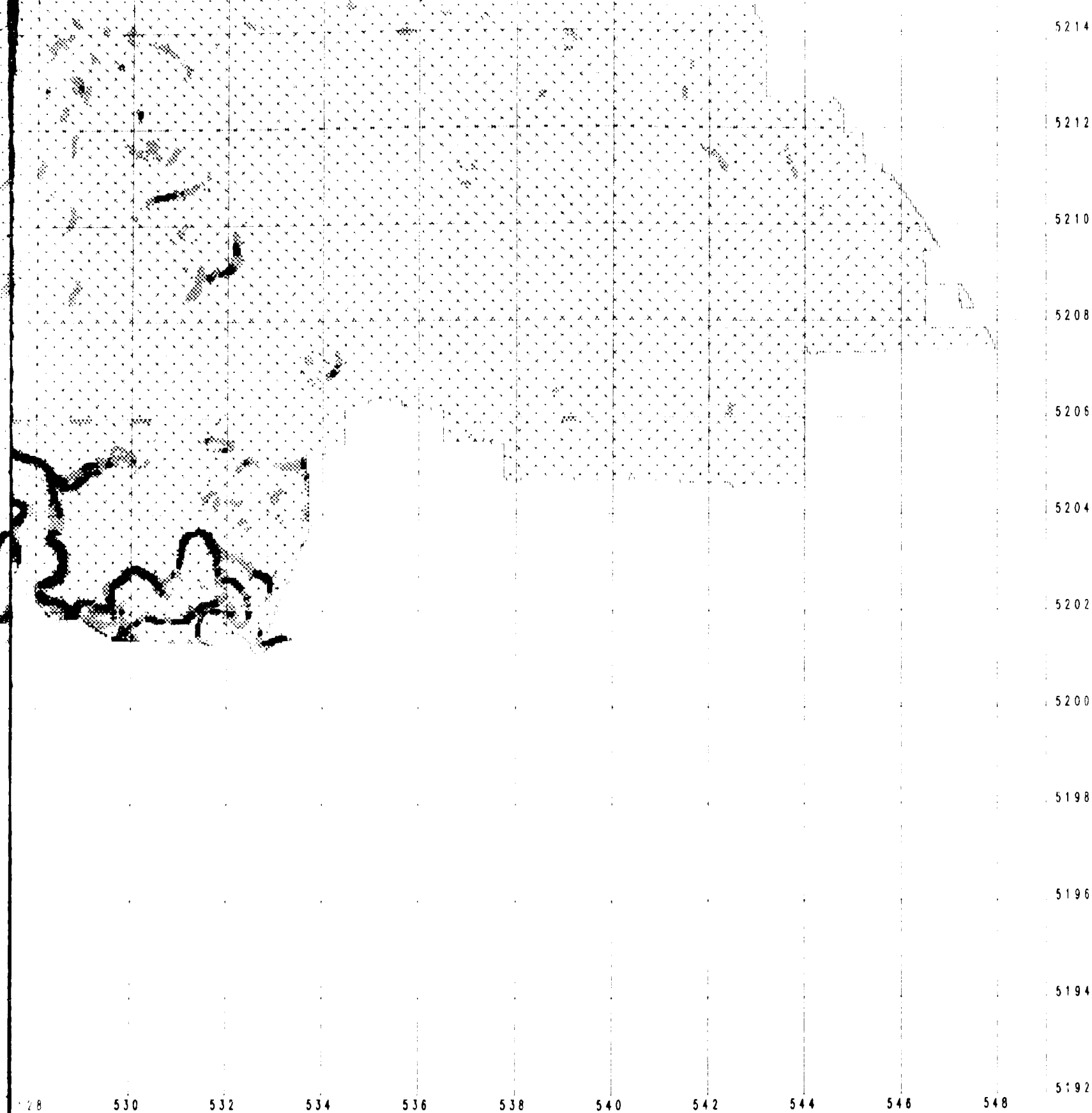


Plate 1. Slope map for Fort Lewis, Washington study area

5214

5212

FT LEWIS, WASHINGTON

5210

5208

5206

Approved for	
NHS	Checked <input checked="" type="checkbox"/>
DRG	T-1 <input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By	
Distribution	
Availability Codes	
Dist	Avail and/or Special
A-1	



5204

5202

5200

5198

5196

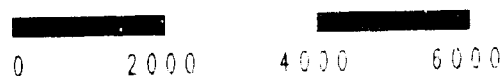
5194

5192

548

N

METERS



5224⁵¹⁴

516

516

520

522

524

526

528

530

5 2 2 2

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200

526

528

530

532

534

536

538

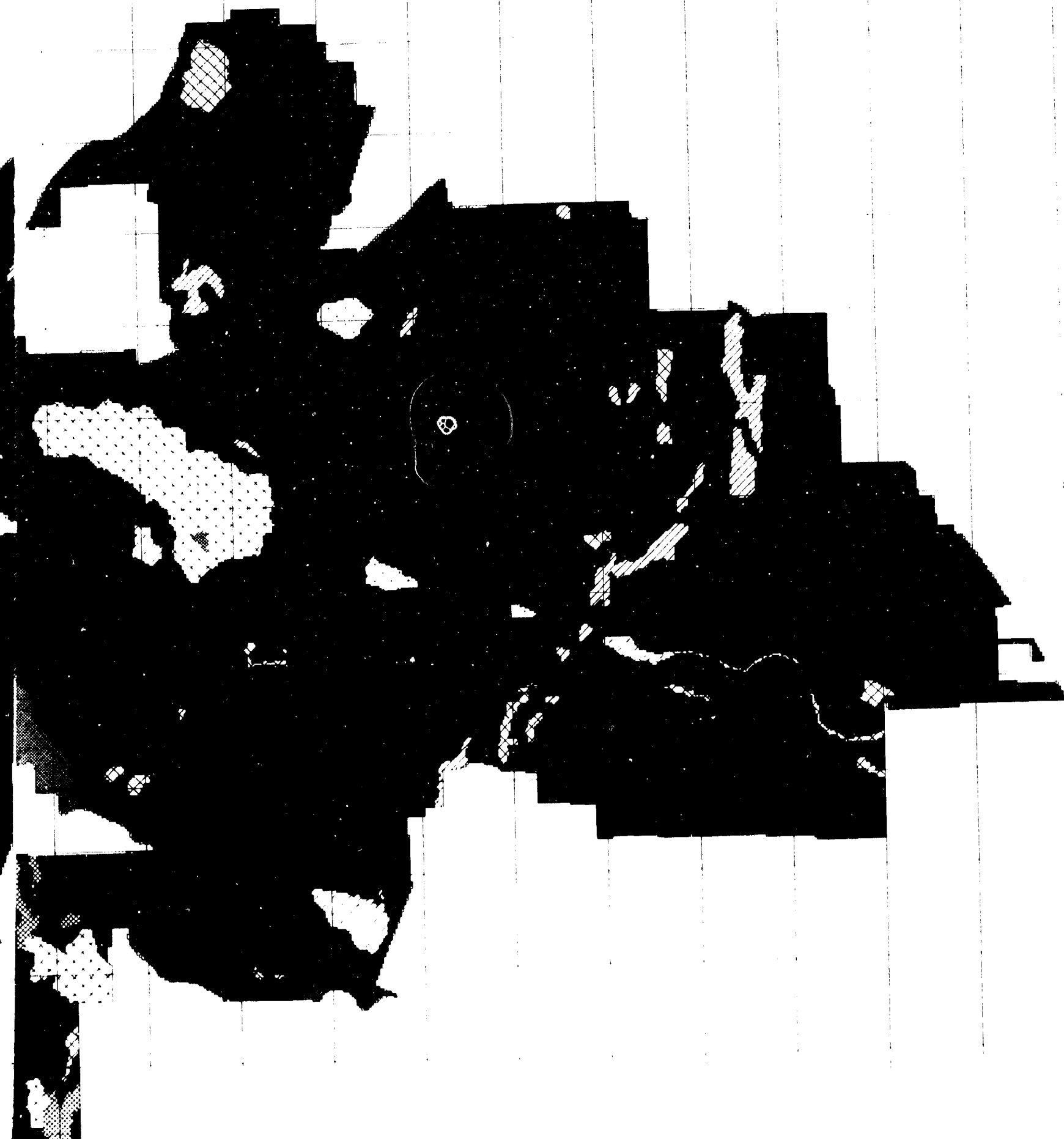
540

542

544

546

548



548

5224

5222



U. S. Army Corps of Engineers
Waterways
Experiment
Station

5220

USCS SOIL TYPE

5218

SCALE 1:100000

5216

5214

5212

5210

5208

5206

5204

5202

5200

GP

SM

CL

ML-CL

SP

PT

SC

GM

GC

FT LEWIS, WASHINGTON

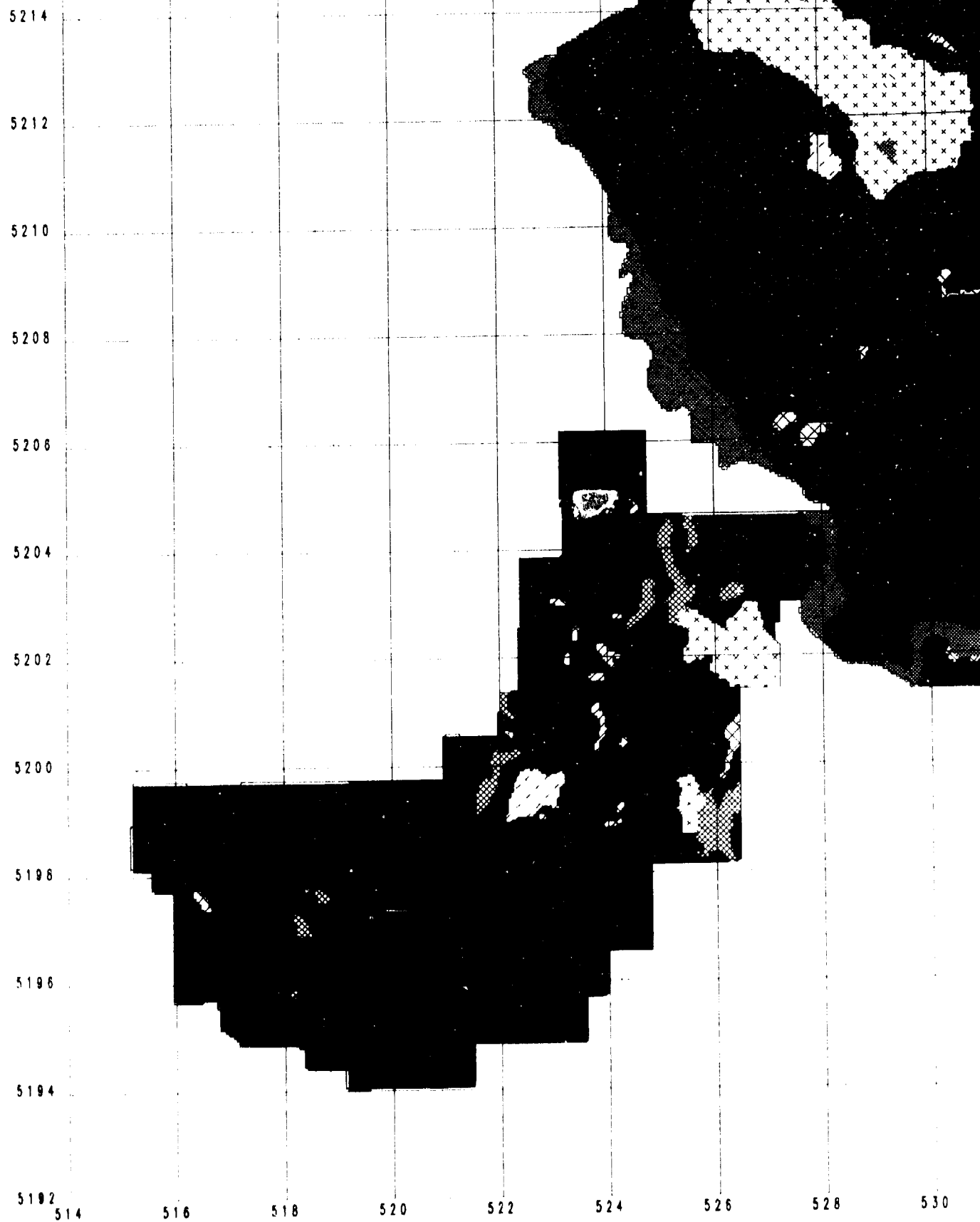
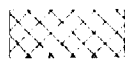


Plate 2.

5214



CL



GM



ML-CL



GC

5212



SP

5210

5208

FT LEWIS, WASHINGTON

5206

5204

5202

5200

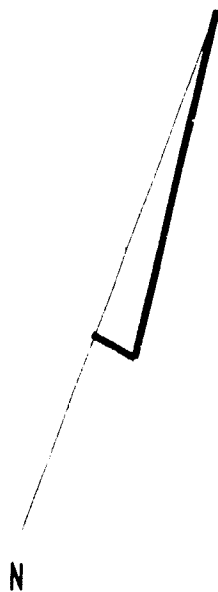
5198

5196

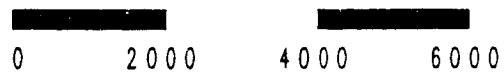
5194

5192

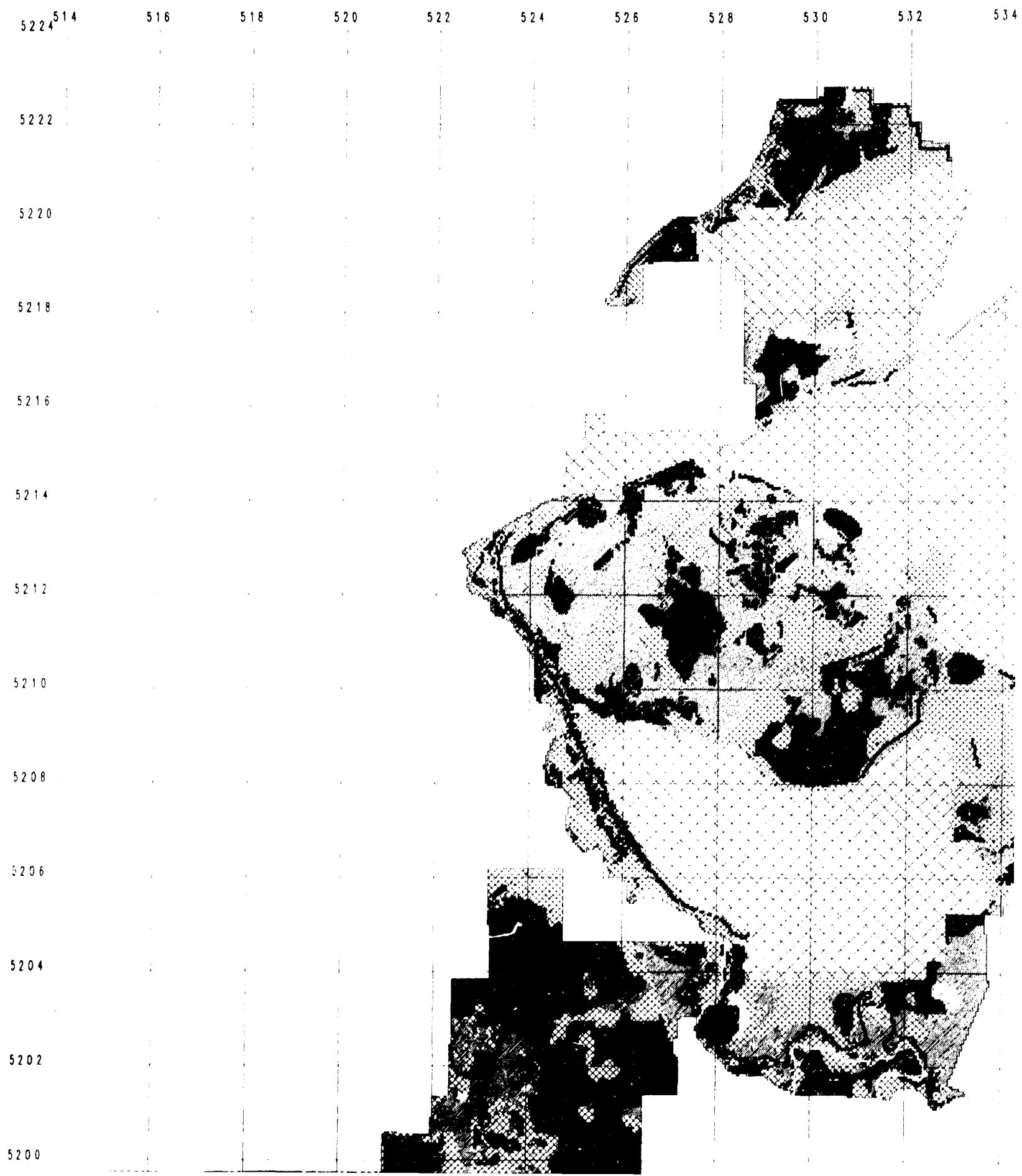
548



METERS



on study area



528

530

532

534

536

538

540

542

544

546

548

5224

5222

5220

5218

5216

5214

5212

5210

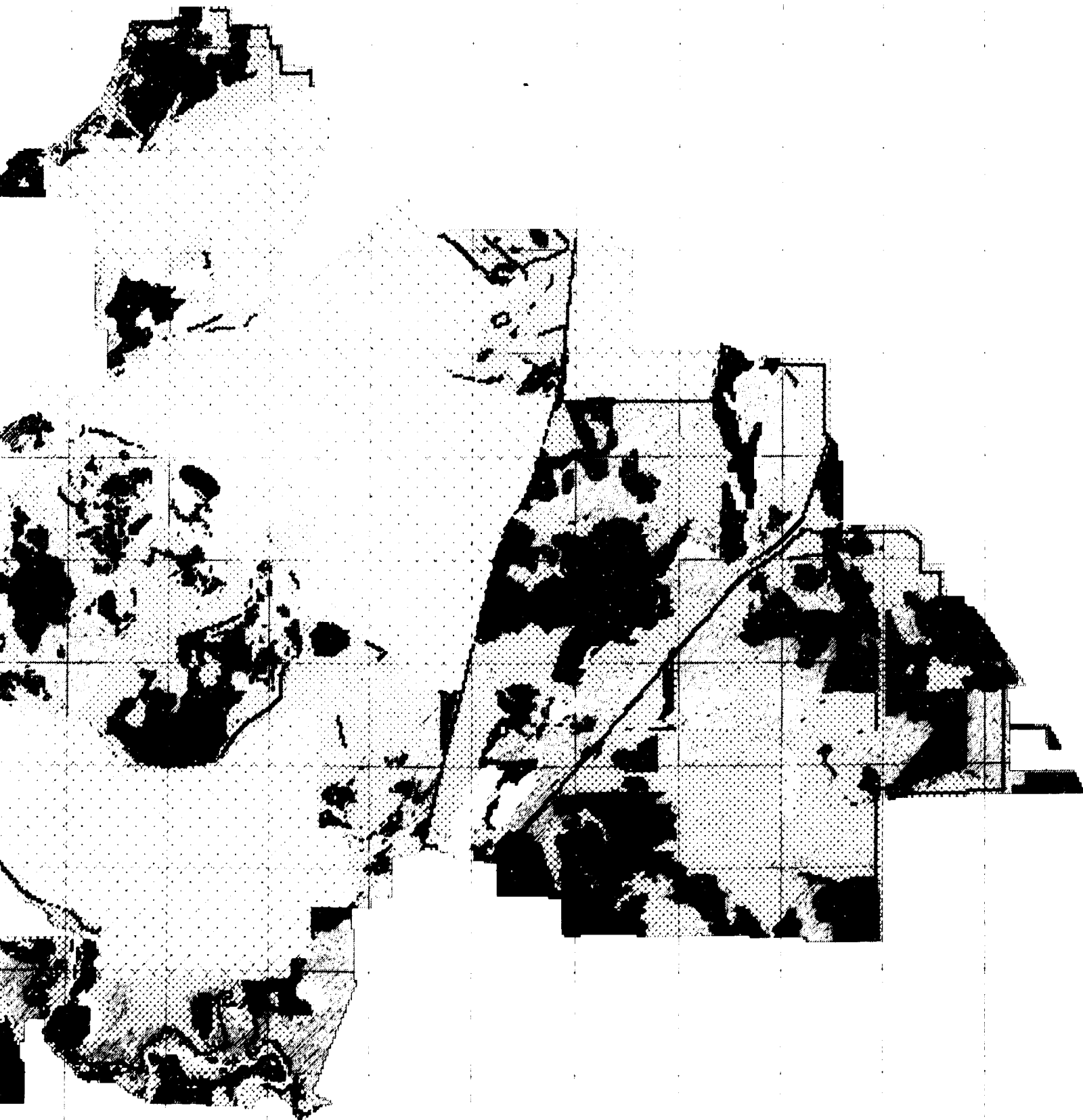
5208

5206

5204

5202

5200





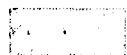





546
548
5224
5222
5220
5218
5216
5214
5212
5210
5208
5206
5204
5202
5200



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SPEED (MPH)
SCALE 1:100000

	< 1		> 10 - 20
	> 1 - 5		> 20 - 30
	> 5 - 10		> 30
	WATER		URBAN / OFF LIMITS

FT LEWIS, WASHINGTON
SPEED MAP
HMMWV
DRY SEASON
NORMAL CONDITION

5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

5194

5192

514

516

518

520

522

524

526

528

530

532

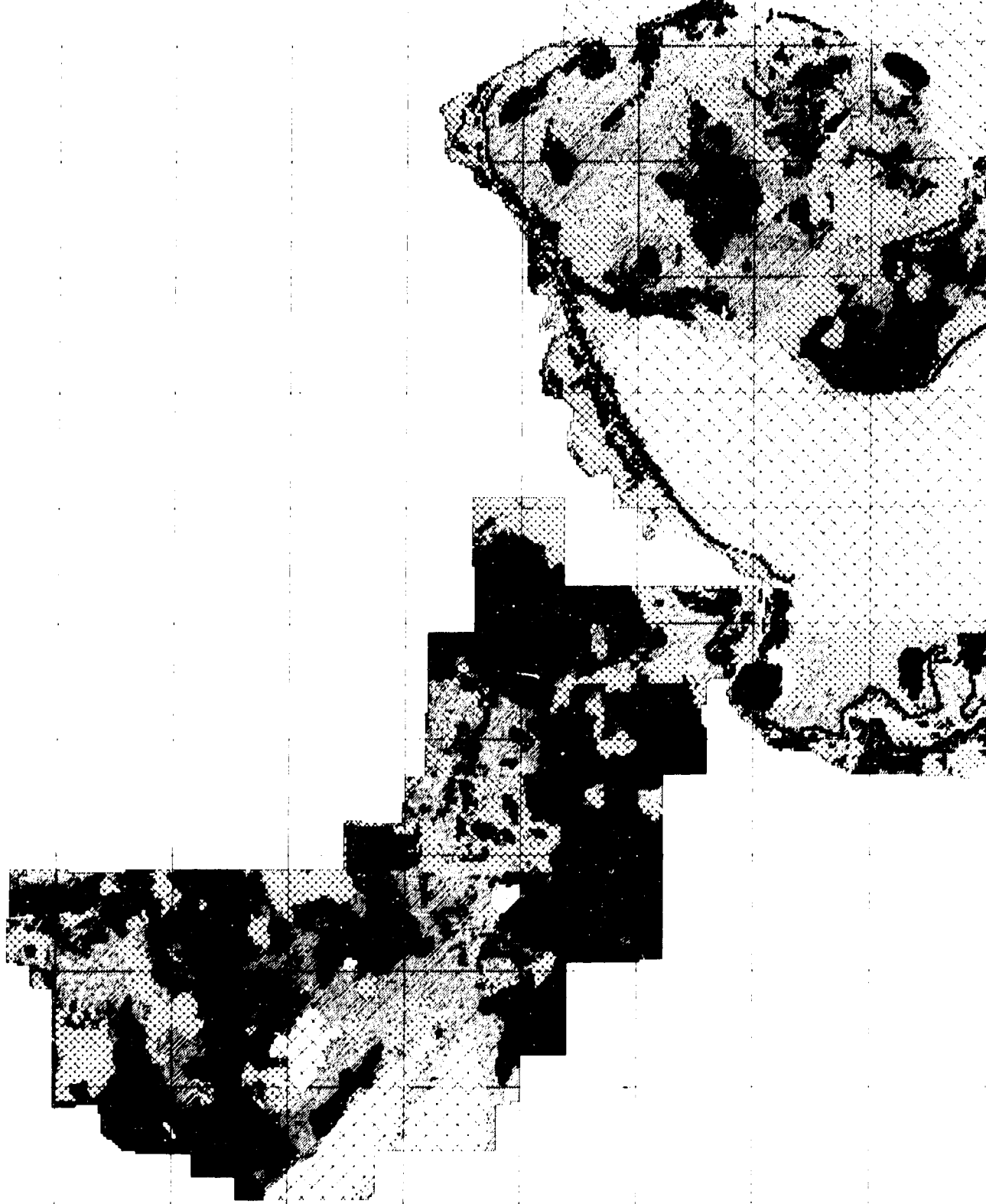


plate 3. Spee



528 530 532 534 536 538 540 542 544 546 548

Plate 3. Speed map for M998 (HMMWV) wheeled vehicle in the dry normal surface

5214

> 5 - 10

> 30

WATER

URBAN /
OFF LIMITS

5212

5210

5208

FT LEWIS, WASHINGTON

SPEED MAP

HMMWV

DRY SEASON

NORMAL CONDITION

5206

5204

5202

5200

5198

5196

5194

5192

METERS

0 2000 4000 6000

N

548

surface condition

5224⁵¹⁴

516

518

520

522

524

526

528

530

5

5222

5220

5218

5216

5214

5212

5210

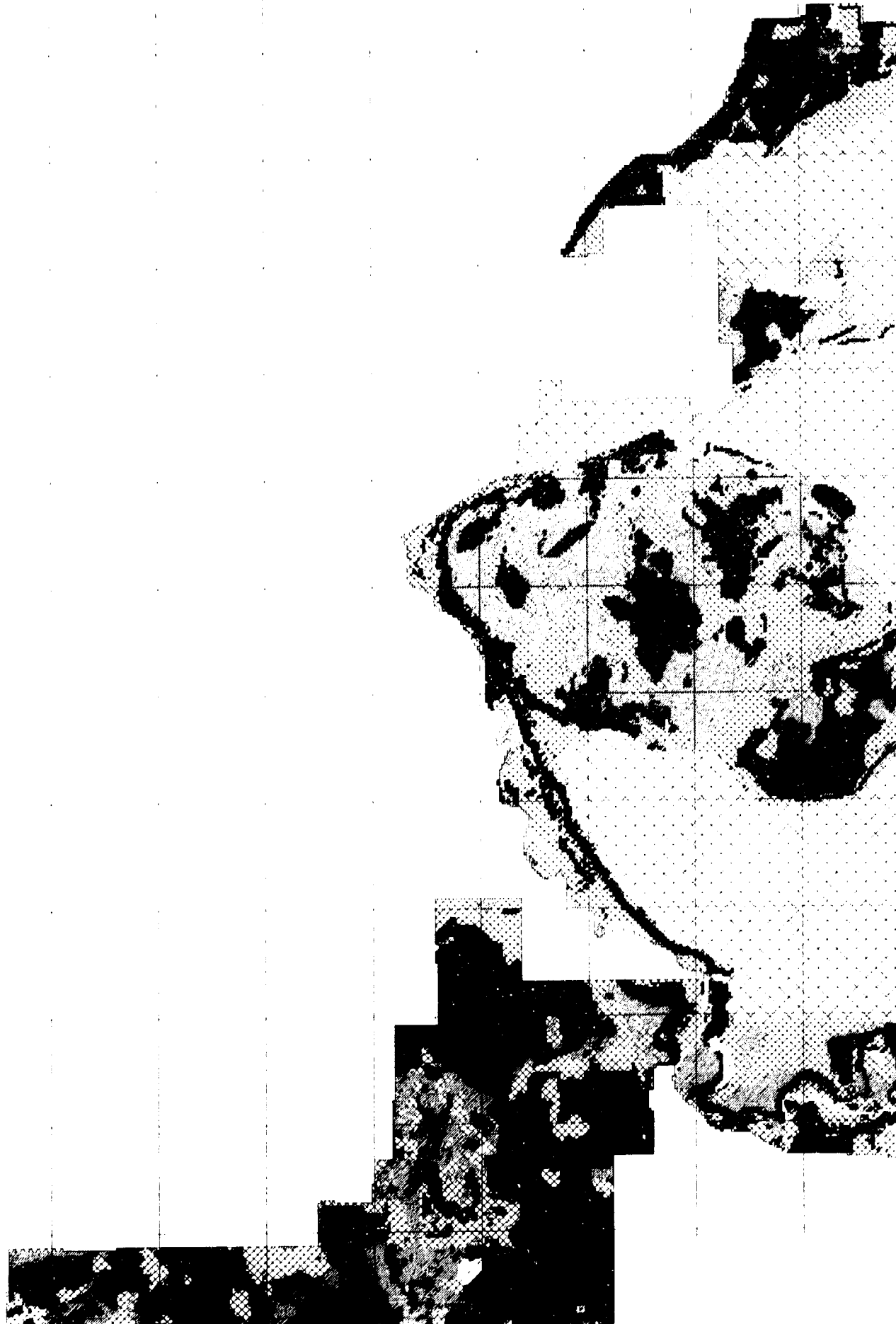
5208

5206

5204

5202

5200



526

528

530

532

534

536

538

540

542

544

546



546

548

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SPEED (MPH)

SCALE 1:100000



< 1



> 10 - 20



> 1 - 5



> 20 - 30



> 5 - 10



> 30

WATER

URBAN /
OFF LIMITS

FT LEWIS, WASHINGTON

SPEED MAP

HMMWV

WET SEASON

SLIPPERY CONDITION

5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

5194

5192

514

516

518

520

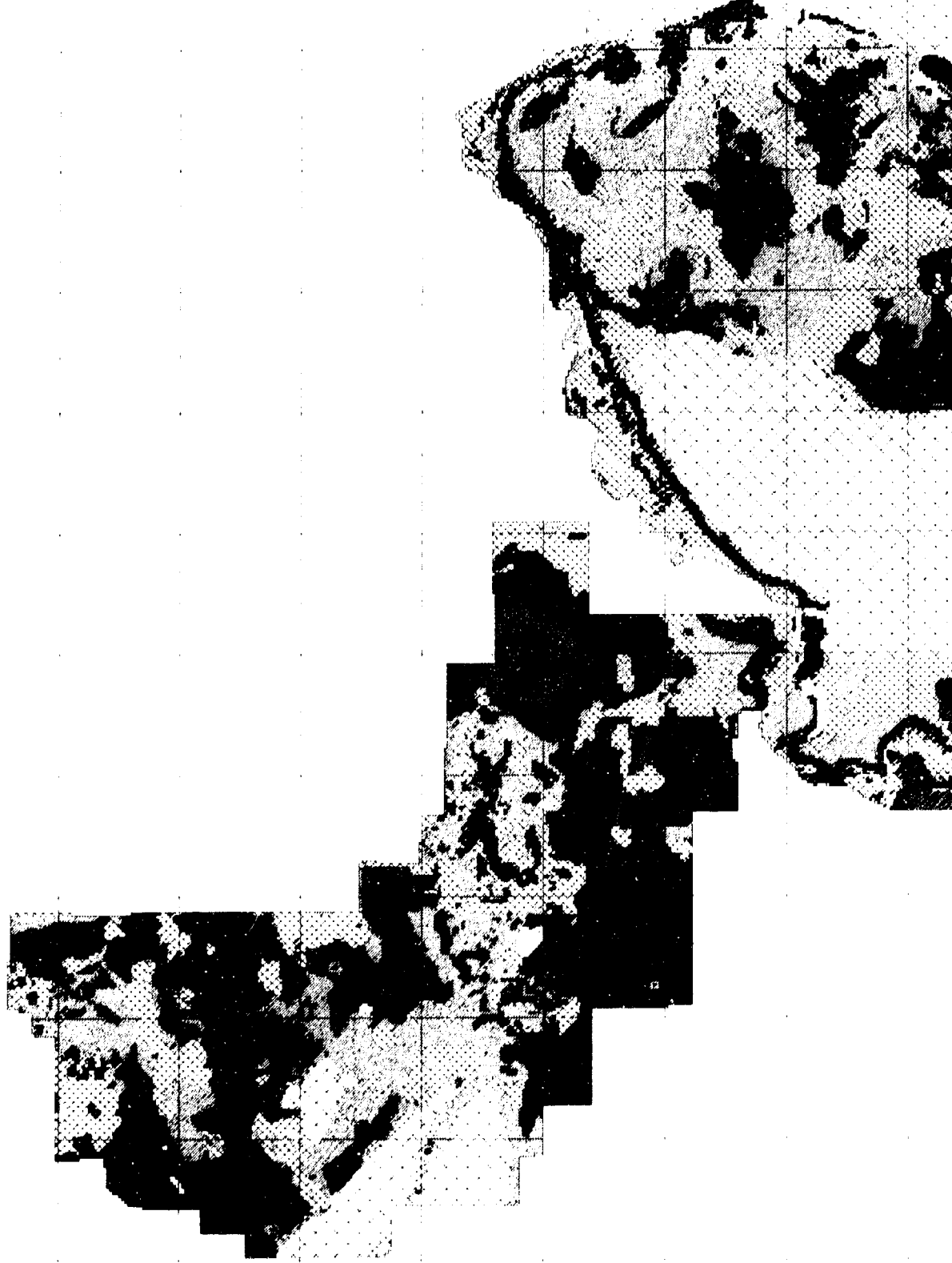
522

524

526

528

530



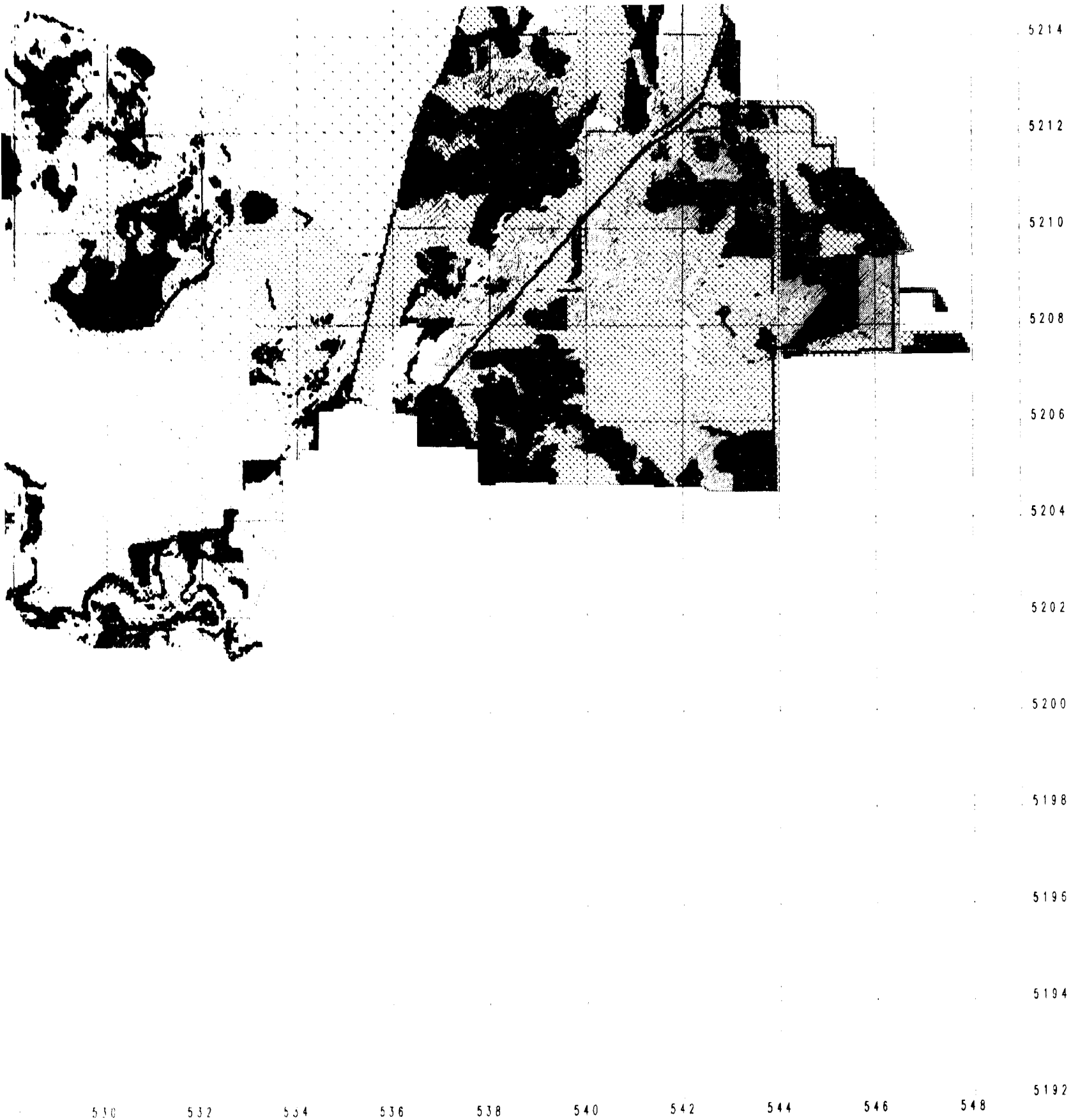


Plate 4. Speed map for M998 (HMMWV) wheeled vehicle in the wet slippery surface condition

5214

> 5 - 10

> 30

5212

WATER

URBAN /
OFF LIMITS

5210

5208

FT LEWIS, WASHINGTON

SPEED MAP

HMMWV

WET SEASON

SLIPPERY CONDITION

5206

5204

5202

5200

5198

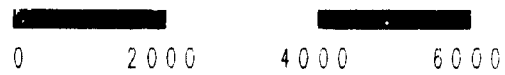
5196

5194

5192



METERS



N

46 548

ry surface condition

5224⁵¹⁴

516

518

520

522

524

526

528

530

532

534

5222

5220

5218

5216

5214

5212

5210

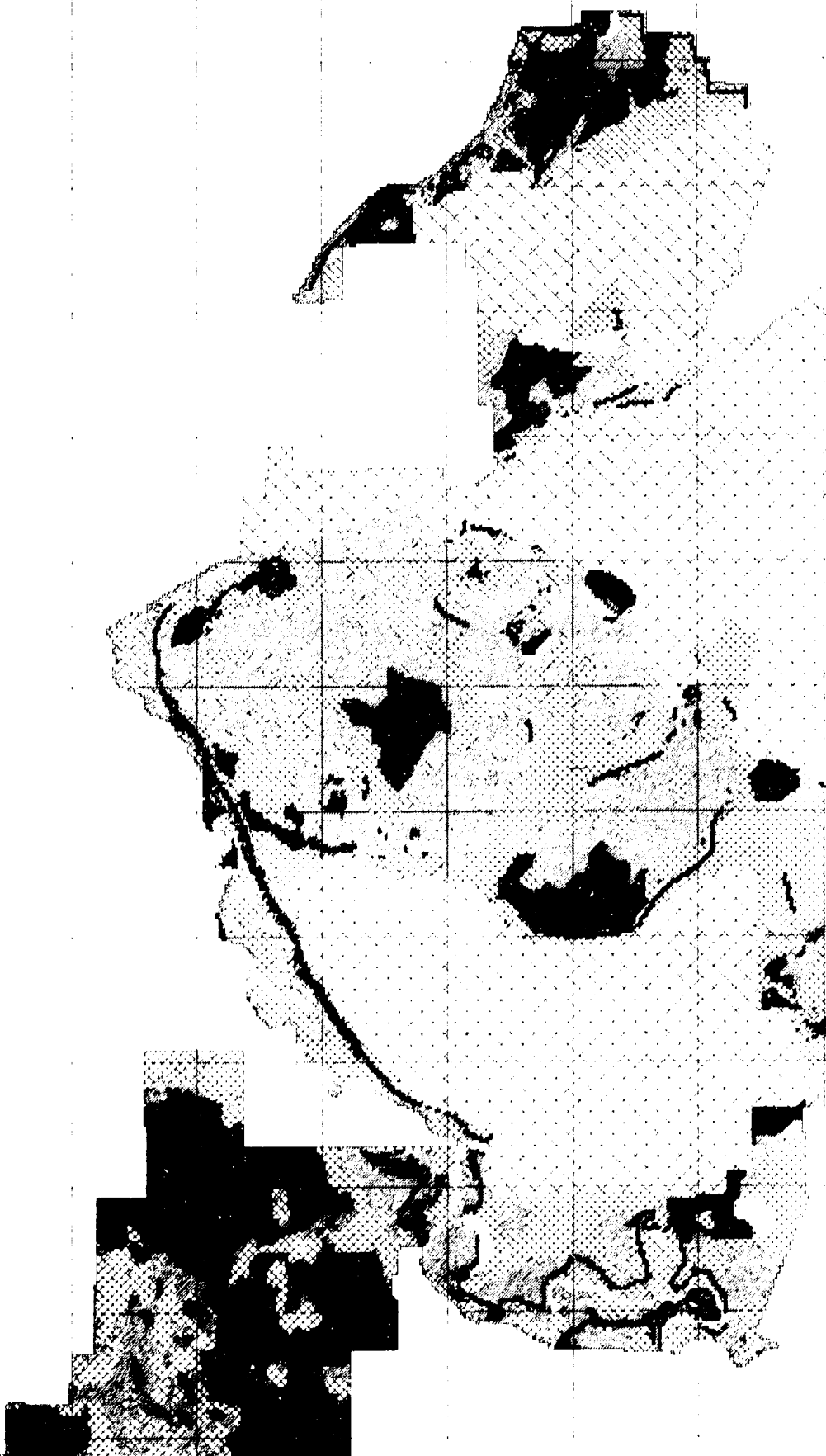
5208

5206

5204

5202

5200



528

530

532

534

536

538

540

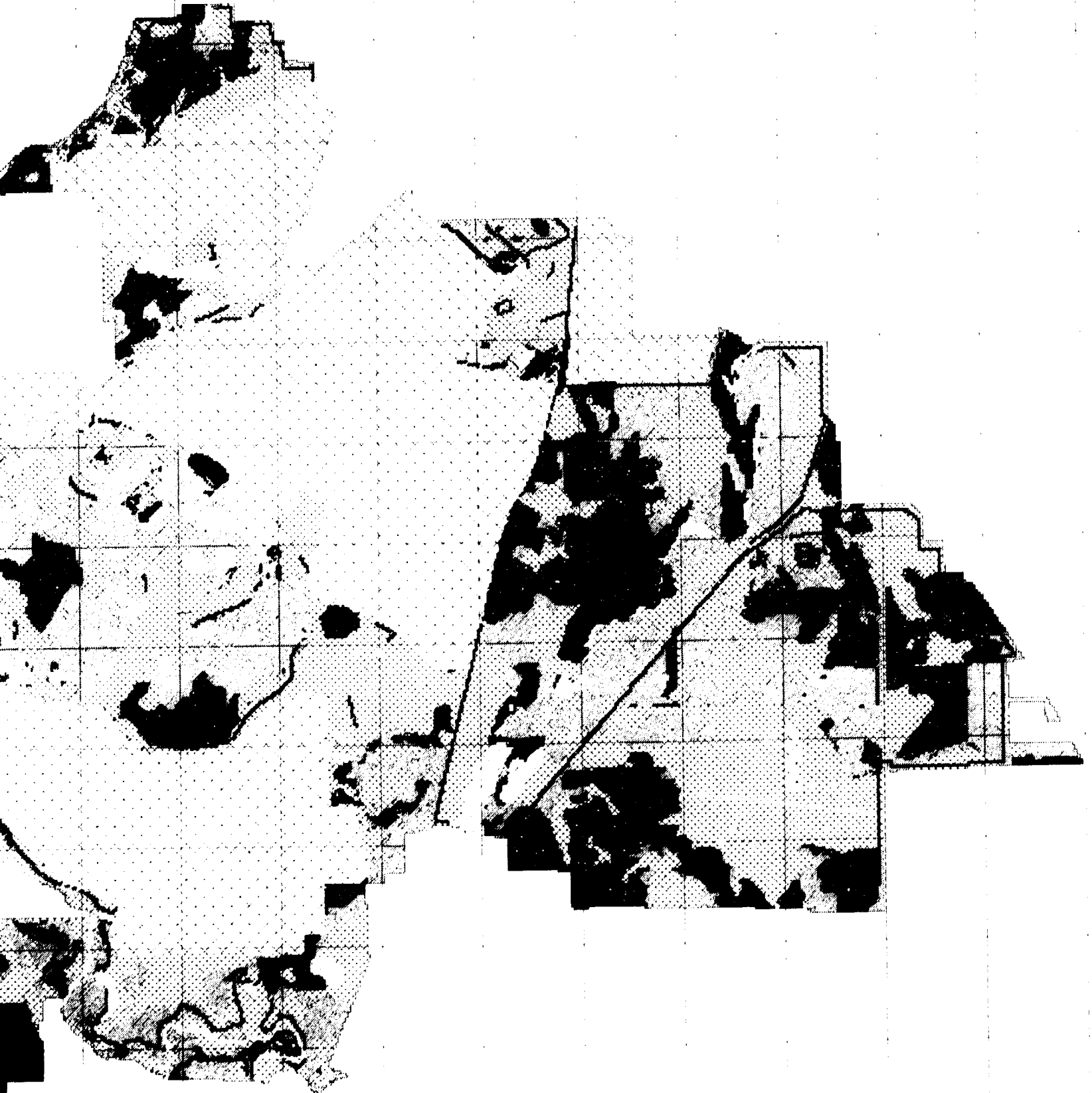
542

544

546

548

5



546 548 5224

5222

5220



U. S. Army Corps of Engineers
Waterways
Experiment
Station

5218

SPEED (MPH)

SCALE 1:100000

5216



< 1



> 10 - 20

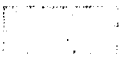
5214



> 1 - 5



> 20 - 30



> 5 - 10



> 30

5212

WATER

URBAN /
OFF LIMITS

5210

5208

FT LEWIS, WASHINGTON

SPEED MAP

5206

8X8 WHEELED COMBAT VEHICLE
DRY SEASON
NORMAL CONDITION

5204

5202

5200

5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

5194

5192

514

516

518

520

522

524

526

528

530

532

534

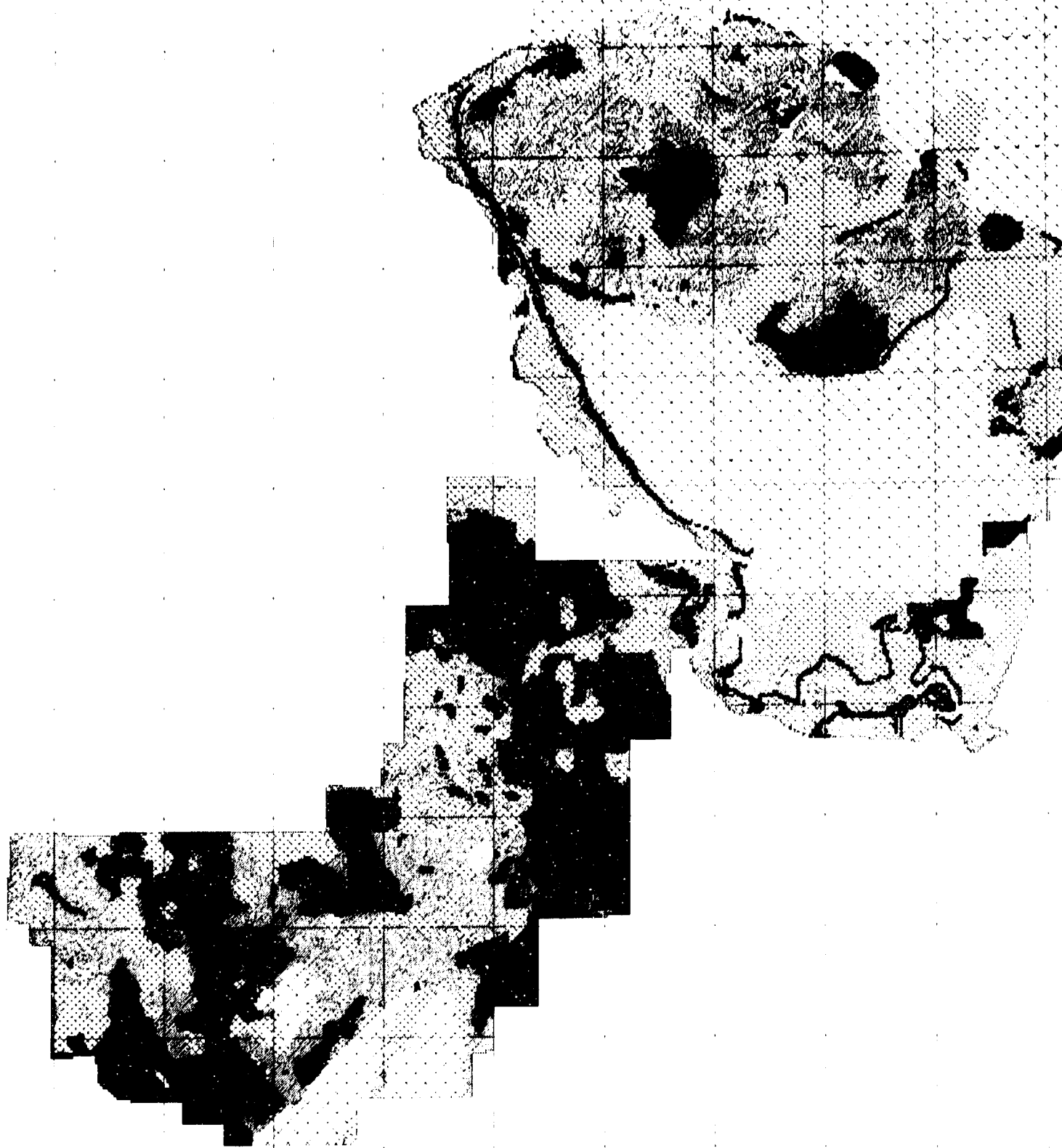
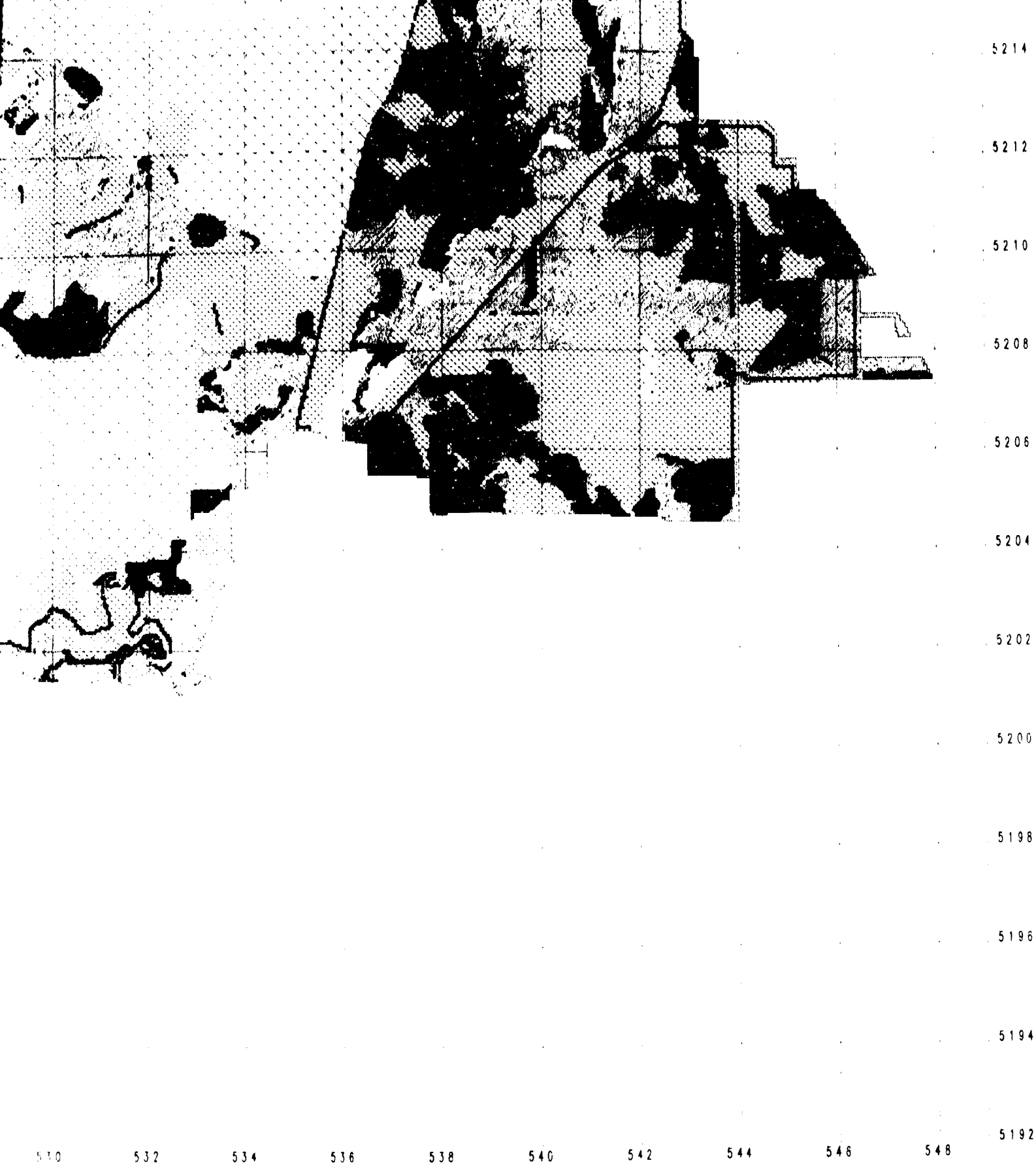


Plate 5. Speed map for 8.



5. Speed map for 8X8 wheeled combat vehicle in the dry normal surface condition

5214

> 5 - 10

> 30

WATER

URBAN /
OFF LIMITS

5212

5210

5208

FT LEWIS, WASHINGTON

SPEED MAP

5206

8X8 WHEELED COMBAT VEHICLE

DRY SEASON

NORMAL CONDITION

5204

5202

5200

5198

5196

METERS

0 2000 4000 6000

5194

N

5192

548

ce condition

5224⁵¹⁴

516

518

520

522

524

526

528

530

532

534

5222

5220

5218

5216

5214

5212

5210

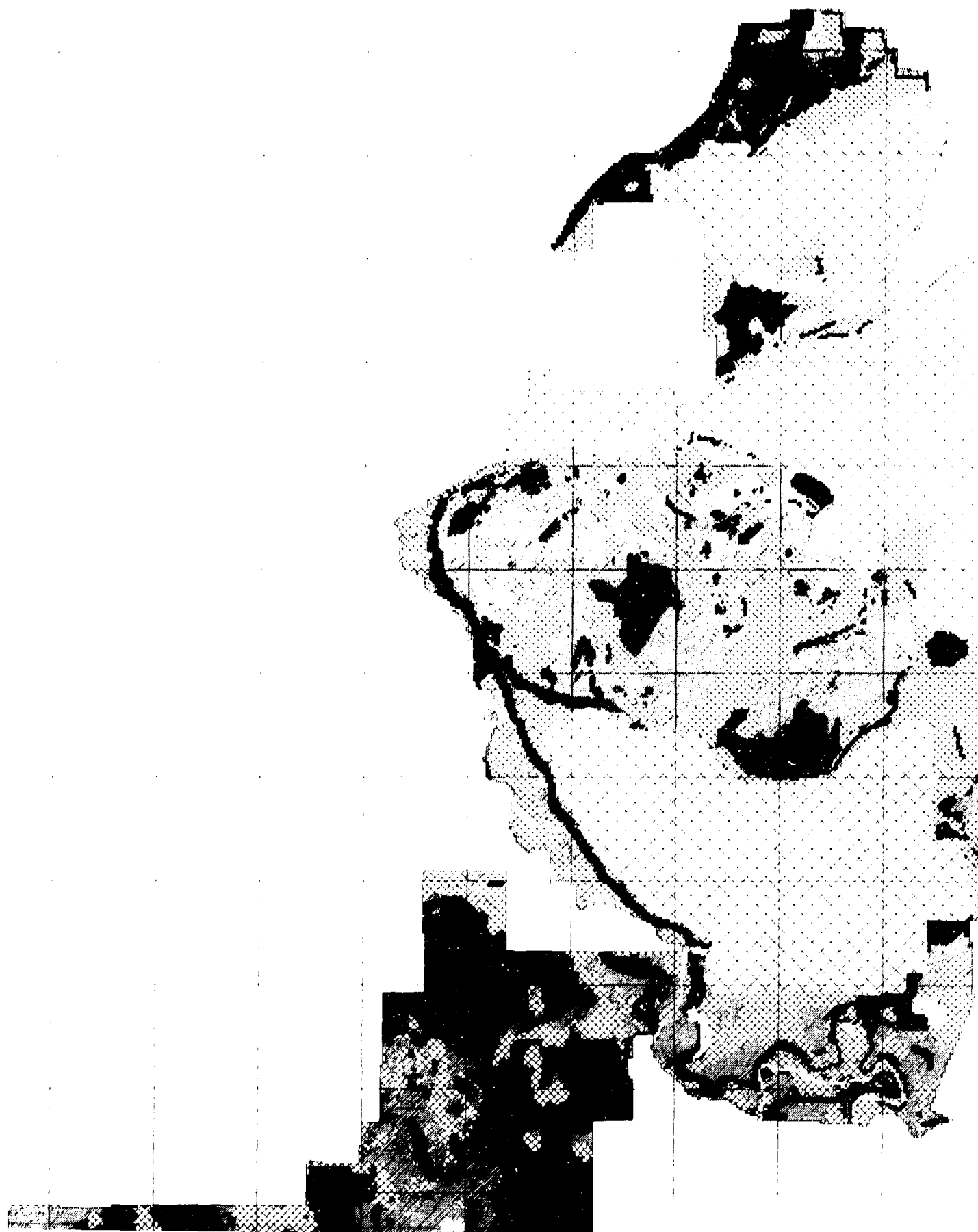
5208

5206

5204

5202

5200



528

530

532

534

536

538

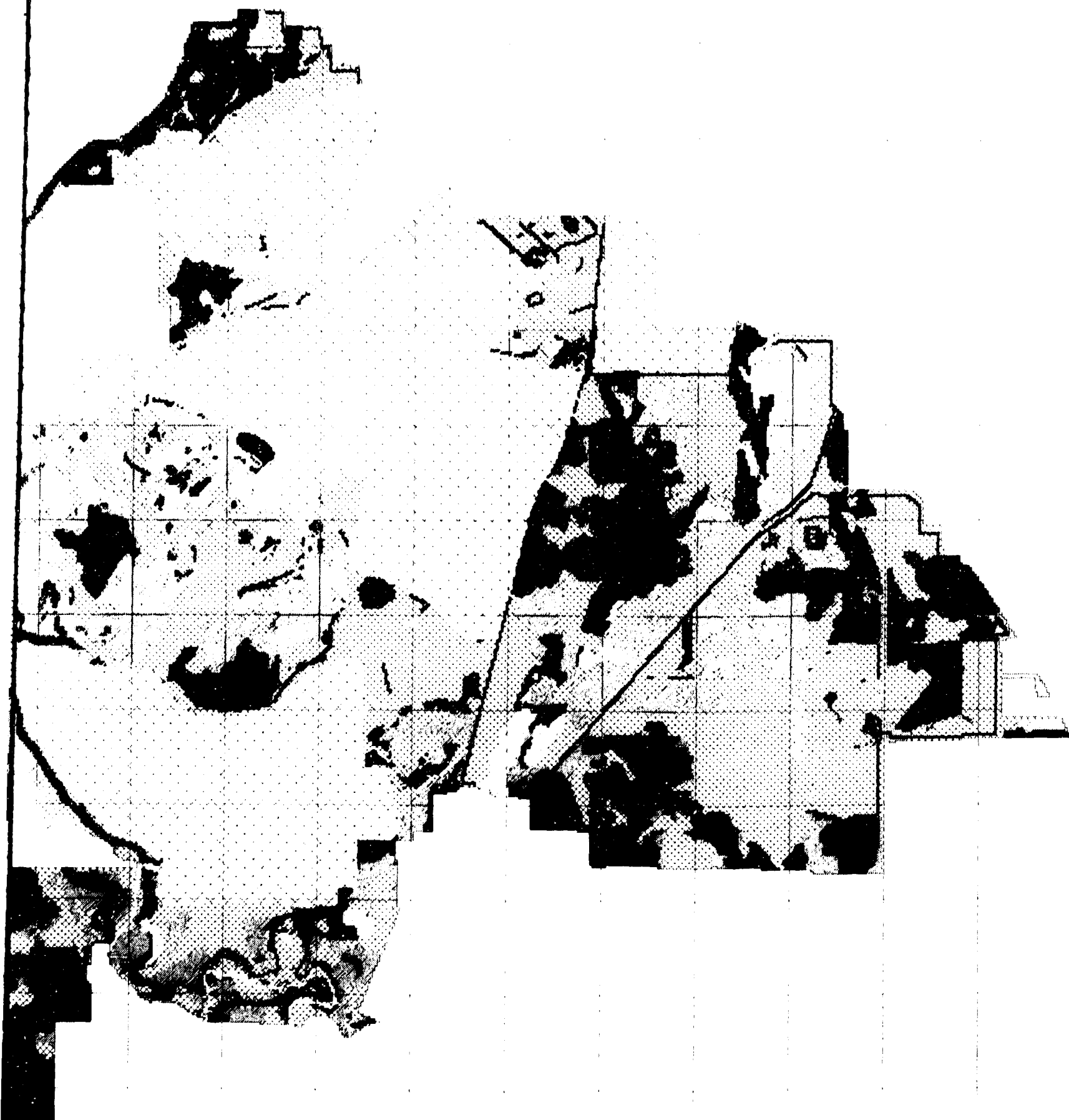
540

542

544

546

548



546

548

5224

5222

5220



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SPEED (MPH)

SCALE 1:100000

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200



< 1



> 10 - 20



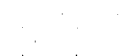
> 1 - 5



> 20 - 30

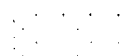


> 5 - 10



> 30

WATER

URBAN /
OFF LIMITS

FT LEWIS, WASHINGTON

SPEED MAP

8X8 WHEELED COMBAT VEHICLE

WET SEASON

SLIPPERY CONDITION

5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

5194

5192

514

516

518

520

522

524

526

528

530

532

534

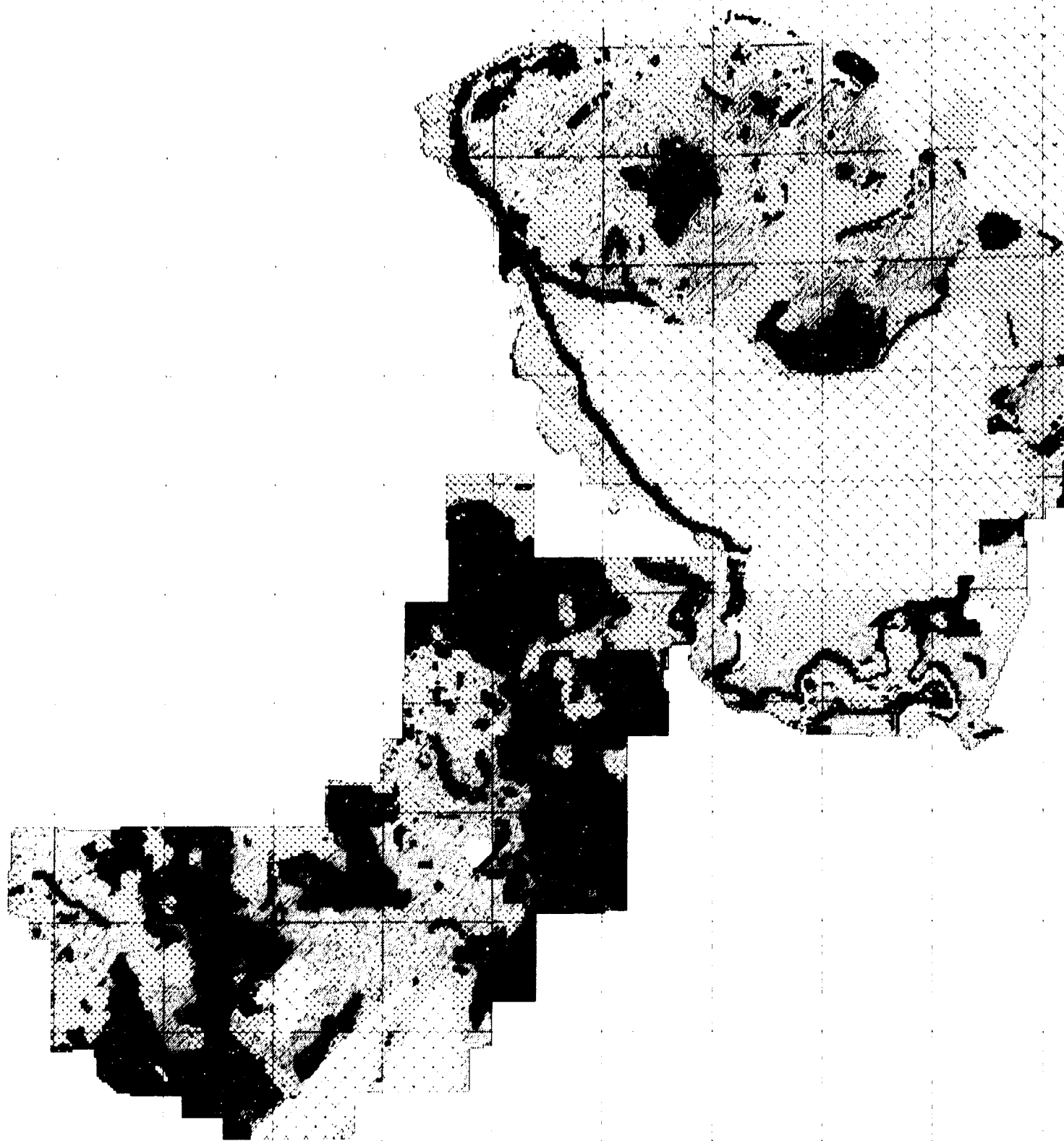
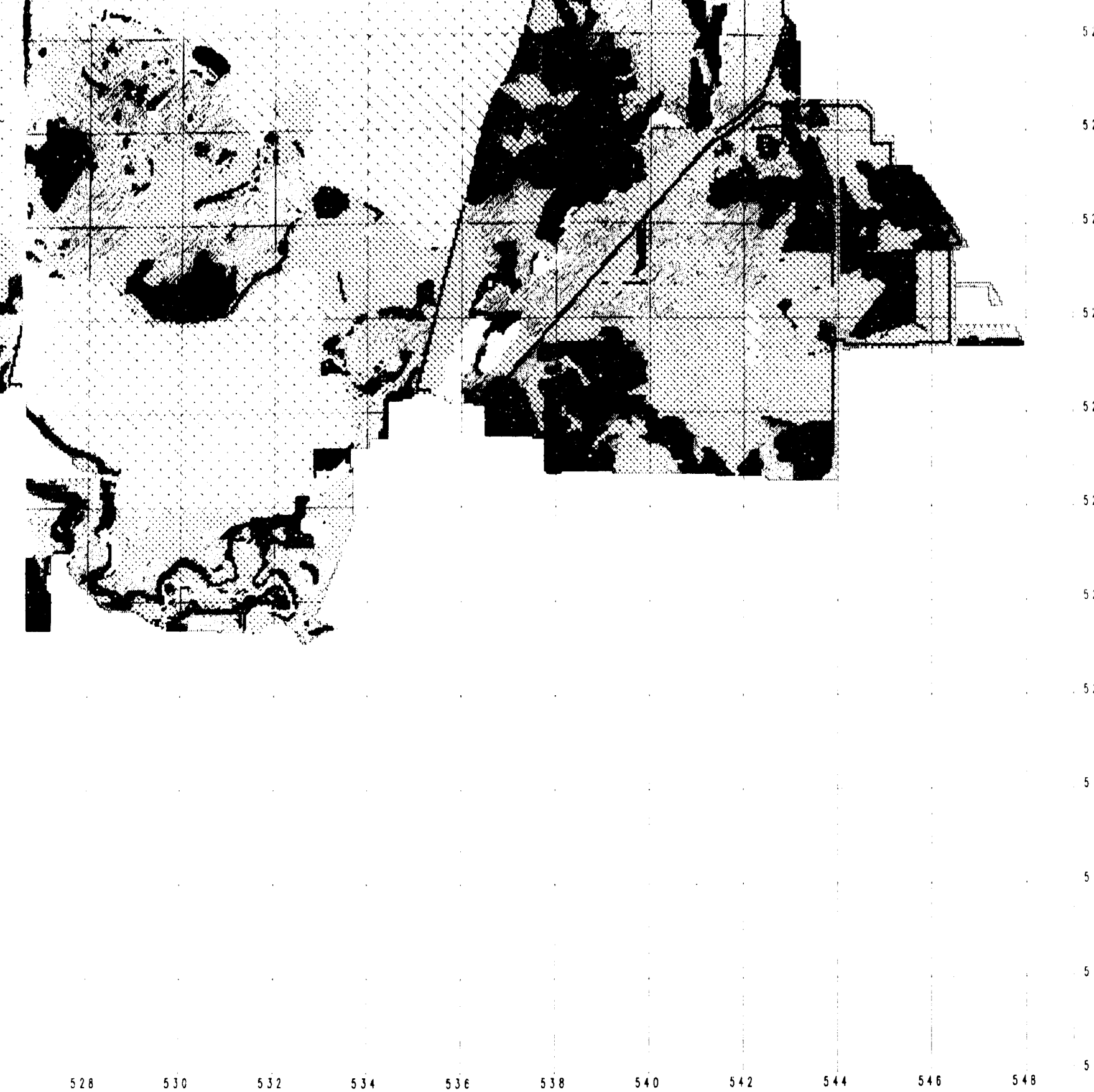


Plate 6. Speed map for 8x



w/ Plate 6. Speed map for 8X8 wheeled combat vehicle in the wet slippery surface condition

5214

> 5 - 10

> 30

WATER

URBAN /
OFF LIMITS

5212

5210

5208

FT LEWIS, WASHINGTON

SPEED MAP

8X8 WHEELED COMBAT VEHICLE

WET SEASON

SLIPPERY CONDITION

5206

5204

5202

5200

5198

5196

5194

5192

N

METERS

0 2000 4000 6000

16

548

surface condition

514 516 518 520 522 524 526 528 530 532 534

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200



528

530

532

534

536

538

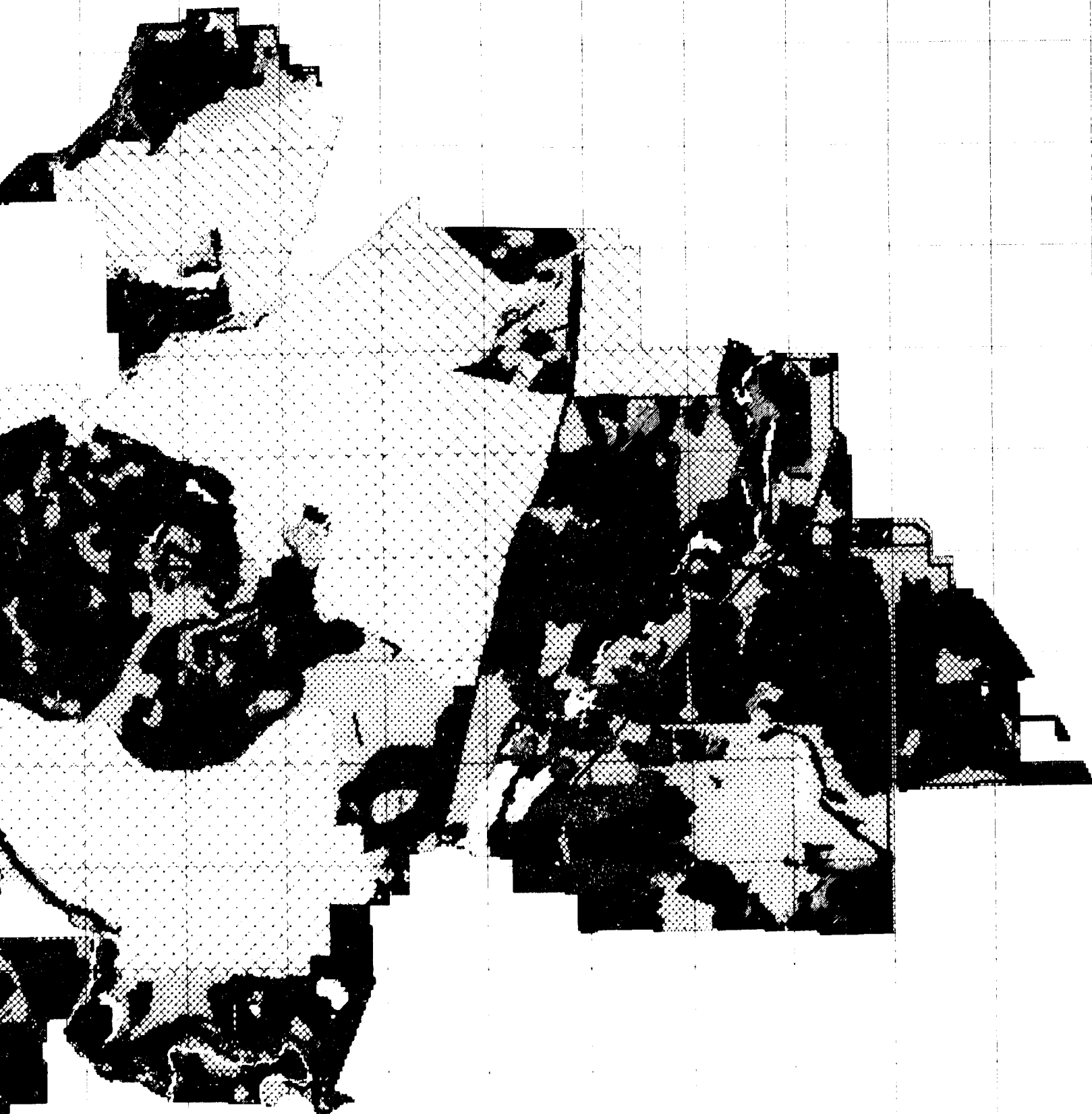
540

542

544

546

548



546

548

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SPEED (MPH)

SCALE 1:100000



< 1



> 10 - 20



> 1 - 5



> 20 - 30



> 5 - 10



> 30



WATER



URBAN /
OFF LIMITS

FT LEWIS, WASHINGTON

SPEED MAP

M60A3

DRY SEASON

NORMAL CONDITION

5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

5194

5192

514

516

518

520

522

524

526

528

530

532

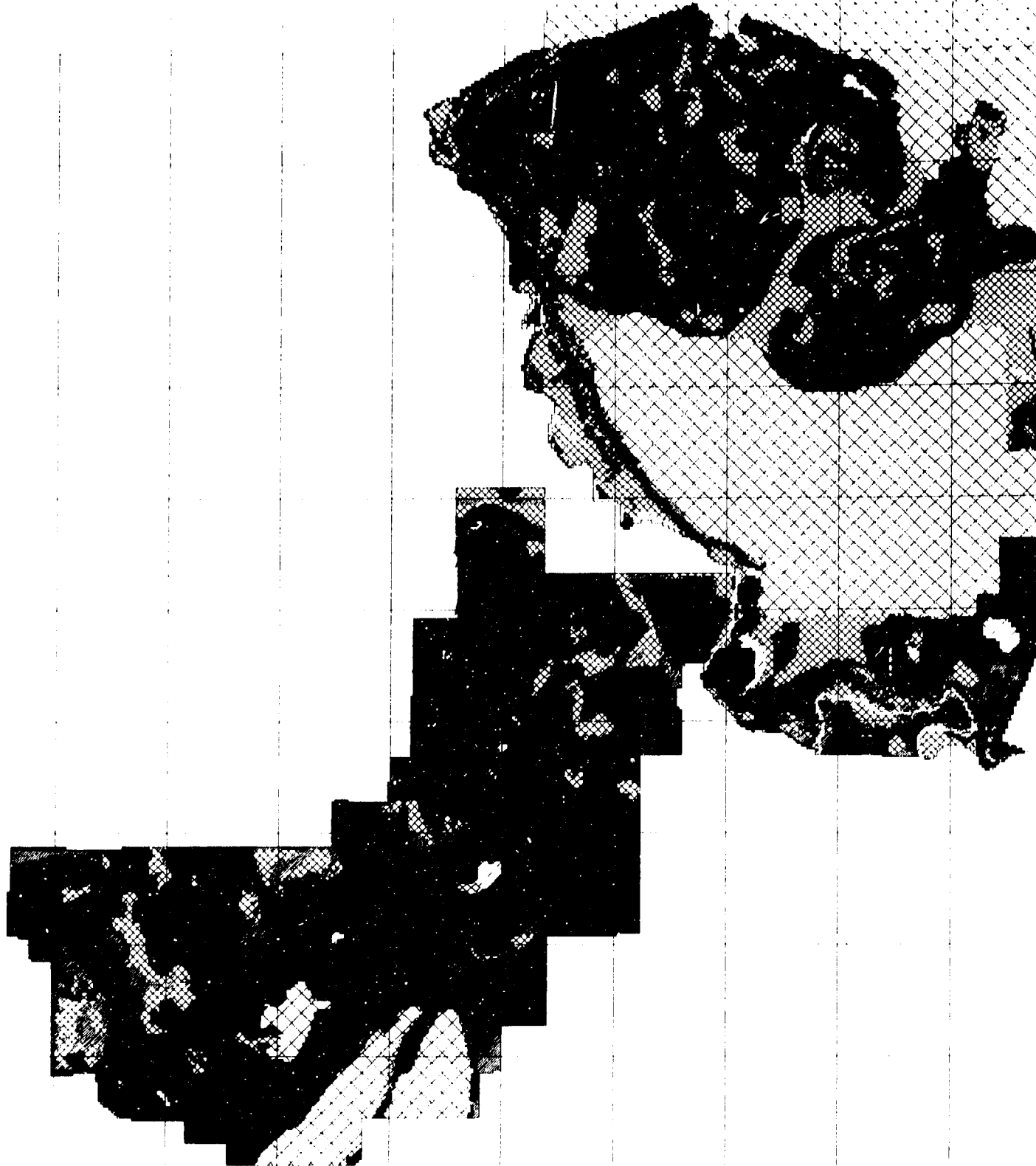
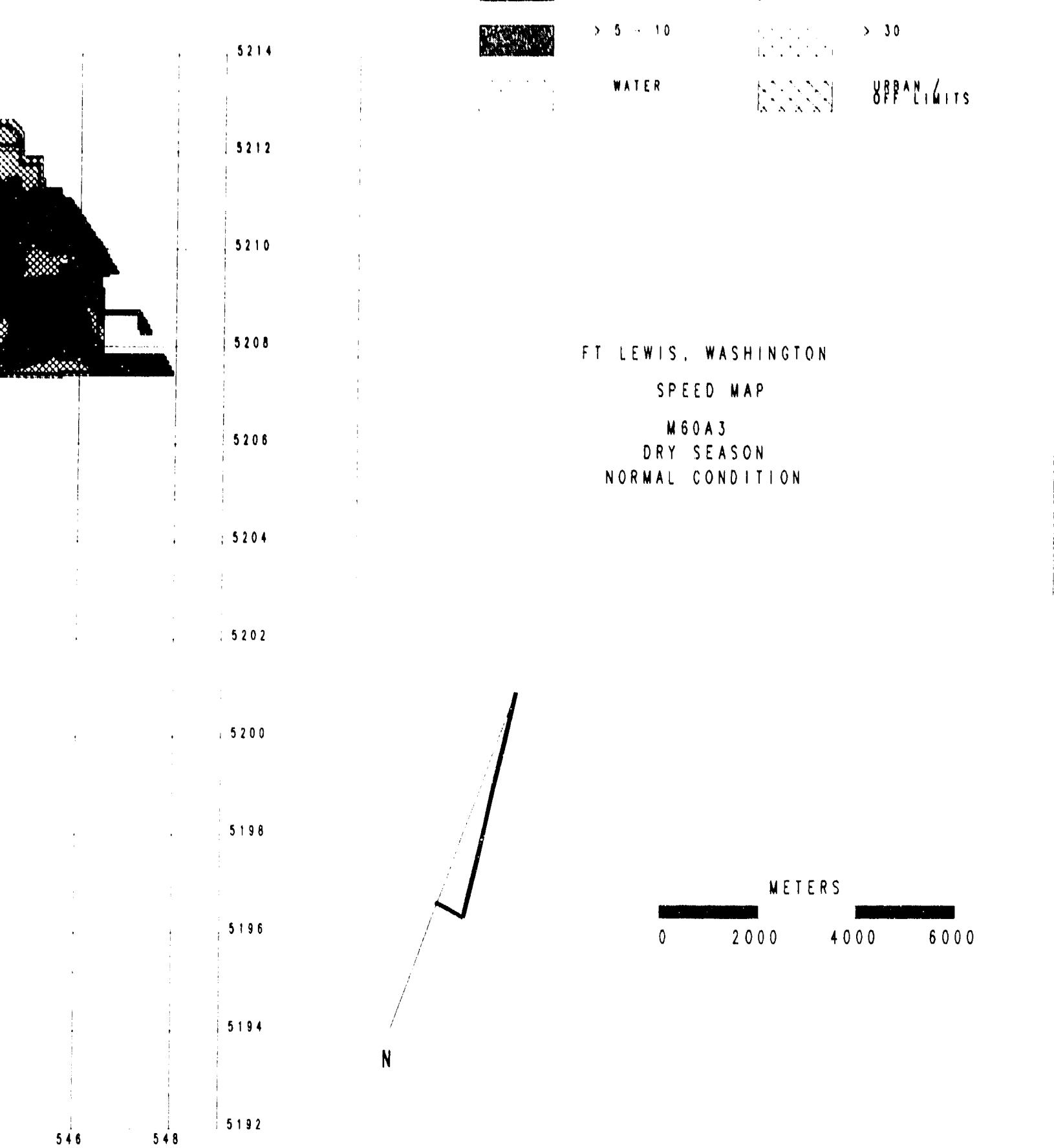


Plate 7. Speed ma



526 528 530 532 534 536 538 540 542 544 546 548

Plate 7. Speed map for M60A3 combat tank in the dry normal surface condition



surface condition

5224⁵¹⁴

516

518

520

522

524

526

528

530

532

534

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200



530

532

534

536

538

540

542

544

546

548

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200

544

546

548

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SPEED (MPH)

SCALE 1:100000



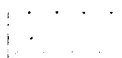
< 1



> 1 - 5



> 5 - 10



WATER



> 10 - 20



> 20 - 30



> 30



URBAN /
OFF LIMITS

FT LEWIS, WASHINGTON

SPEED MAP

M60A3

WET SEASON

SLIPPERY CONDITION

5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

5194

5192

514

516

518

520

522

524

526

528

530

532

534



Plate 8. Speed map :

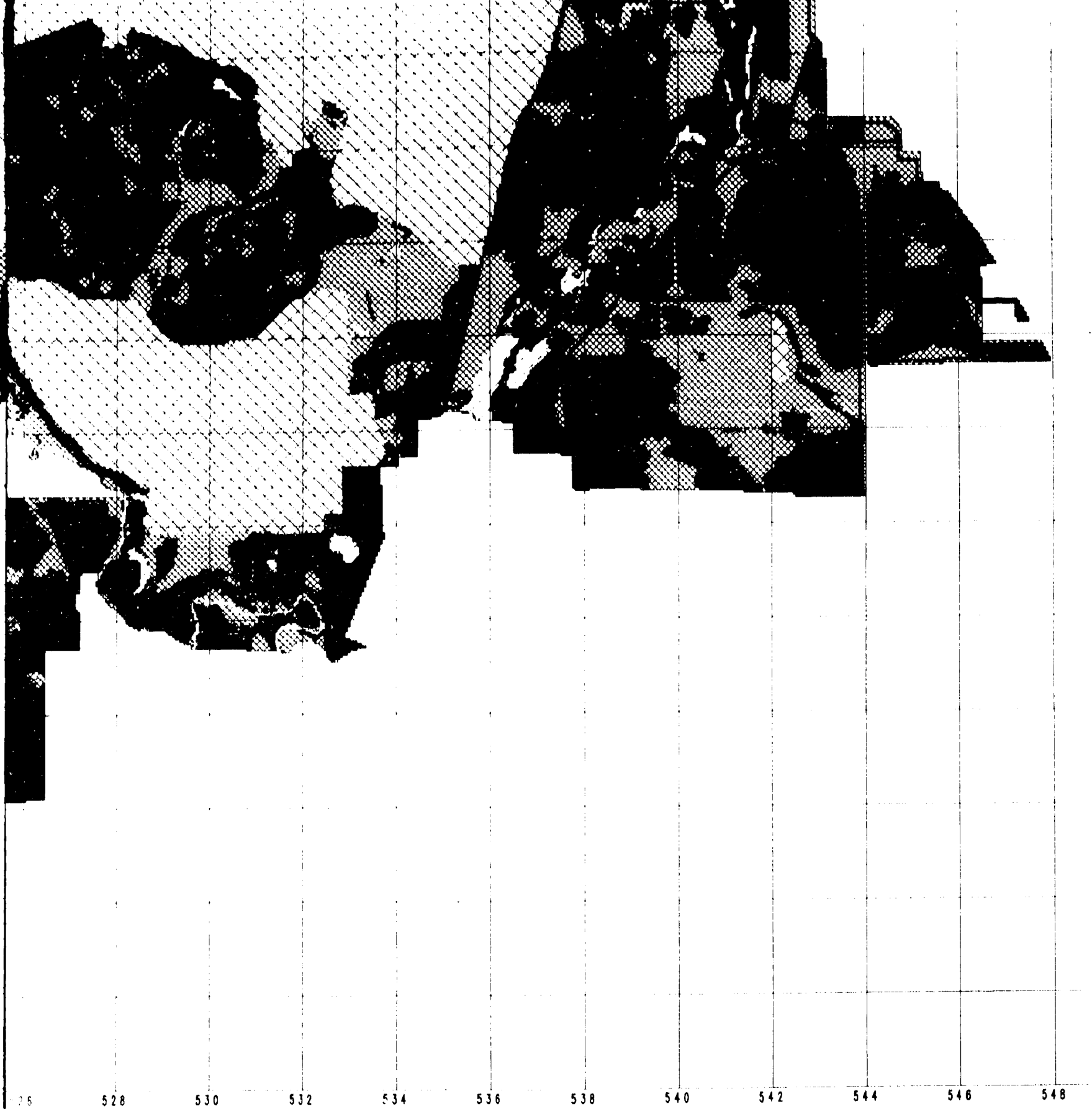
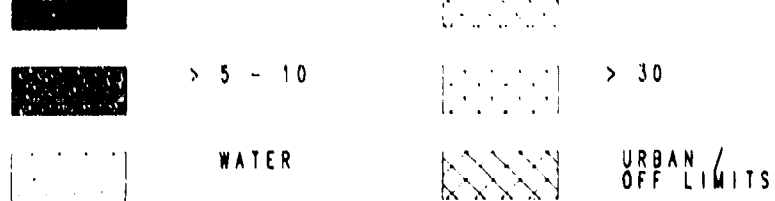
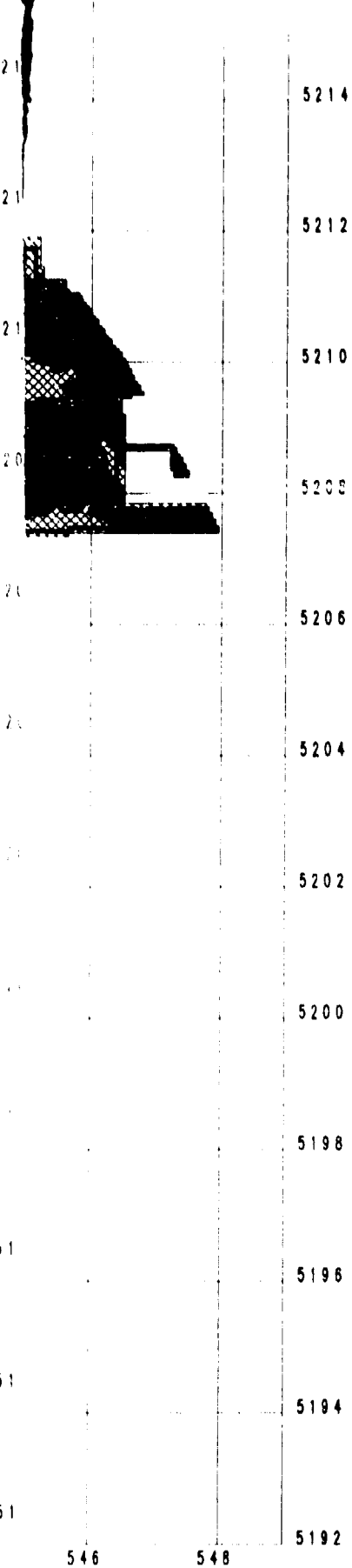
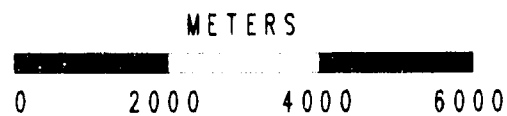
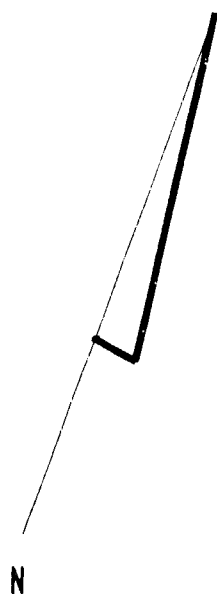


Plate 8. Speed map for M60A3 combat tank in the wet slippery surface condition



FT LEWIS, WASHINGTON
SPEED MAP
M60A3
WET SEASON
SLIPPERY CONDITION



surface condition

5218 5217 5216 5215 5214 5213 5212 5211 5210

5210

5211

5212

5213

5214

5215

5216

5217

5218

5219

5220

5221



526

528

530

532

534

536

538

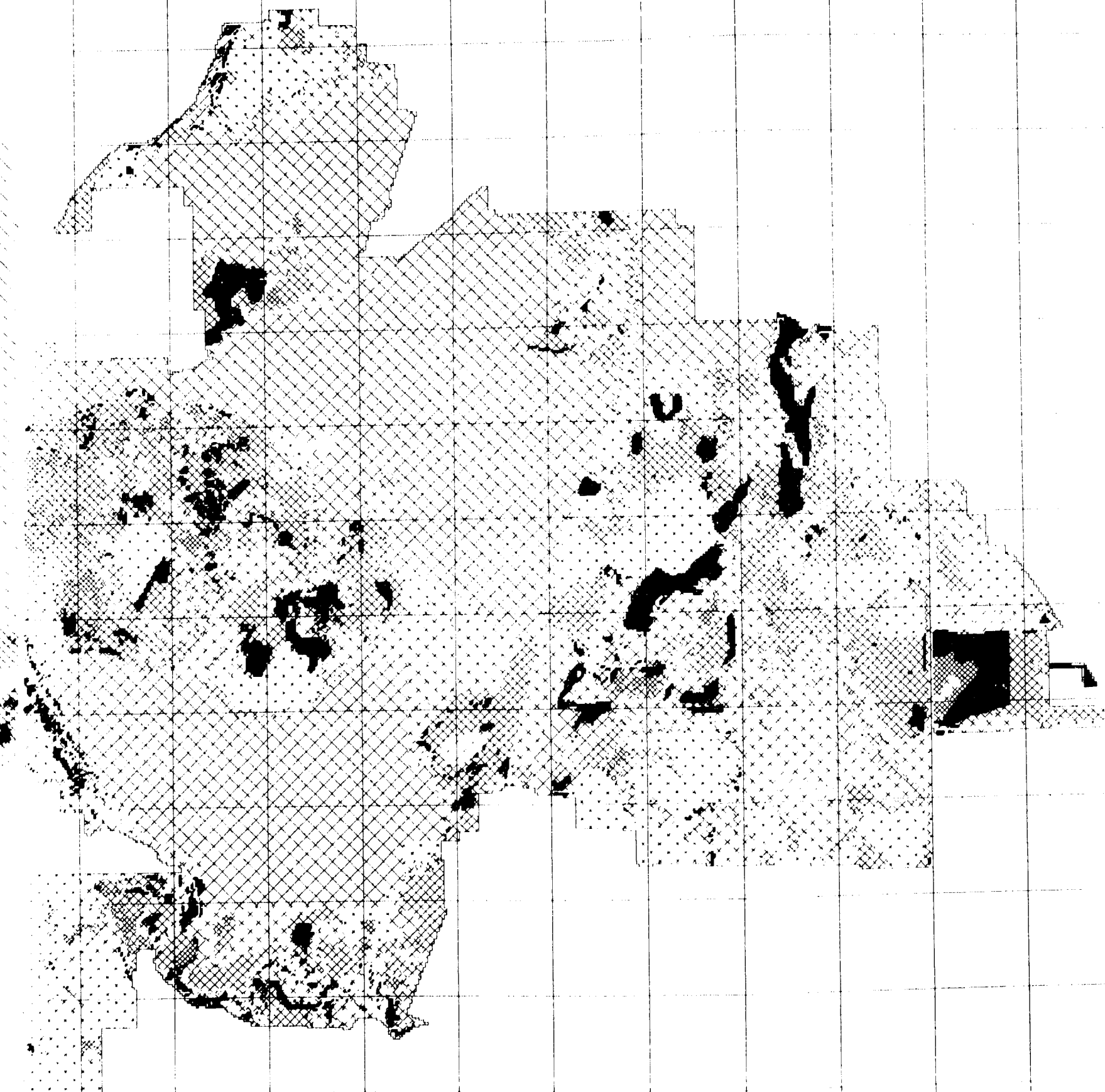
540

542

544

546

548



546

548

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SPEED LIMITING REASON

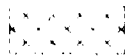
SCALE 1:100000



OBSTACLE



CONE INDEX



VISIBILITY



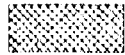
TRACTION



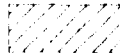
VEGETATION



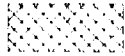
RESISTANCE



ACCELERATION/
DECELERATION



SOIL/SLOPE



MANEUVER



URBAN



RIDE



COMBINATION OF ANY
TWO OR MORE FACTORS

FT. LEWIS, WASHINGTON

HMMWV

DRY SEASON

NORMAL CONDITION

5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

5194

5192
514

516

518

520

522

524

526

528

530

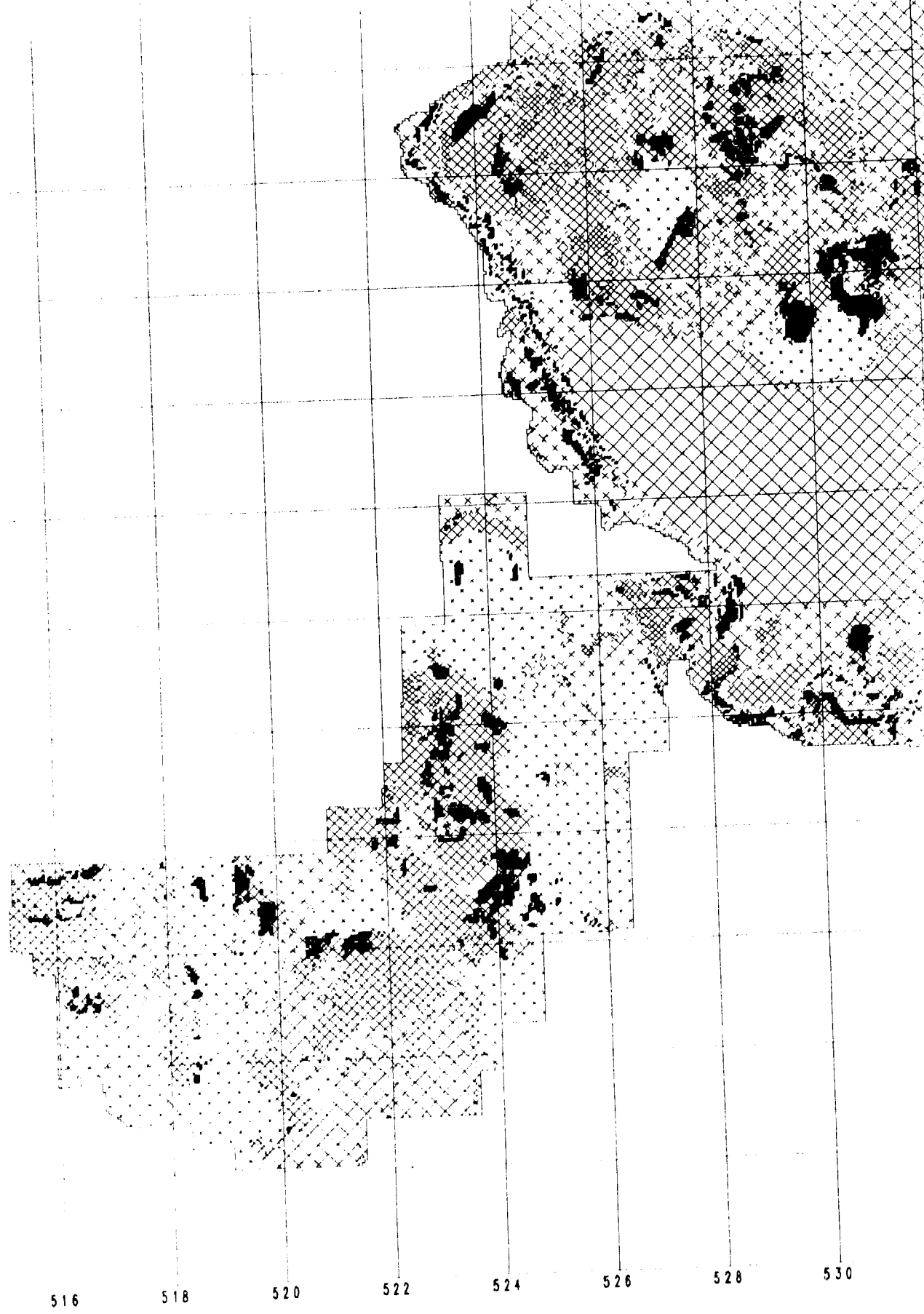


Plate 9. Speed lim

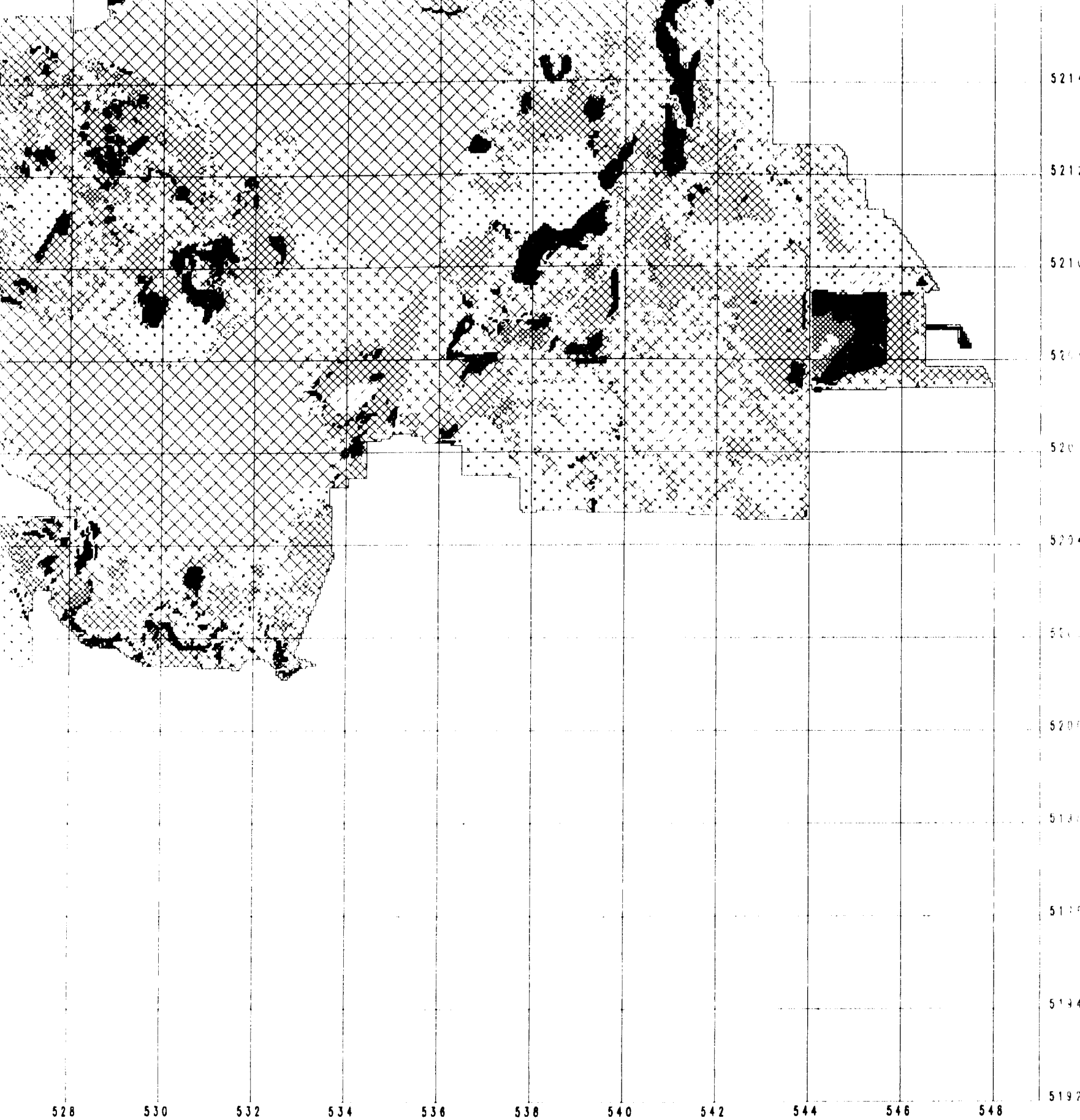
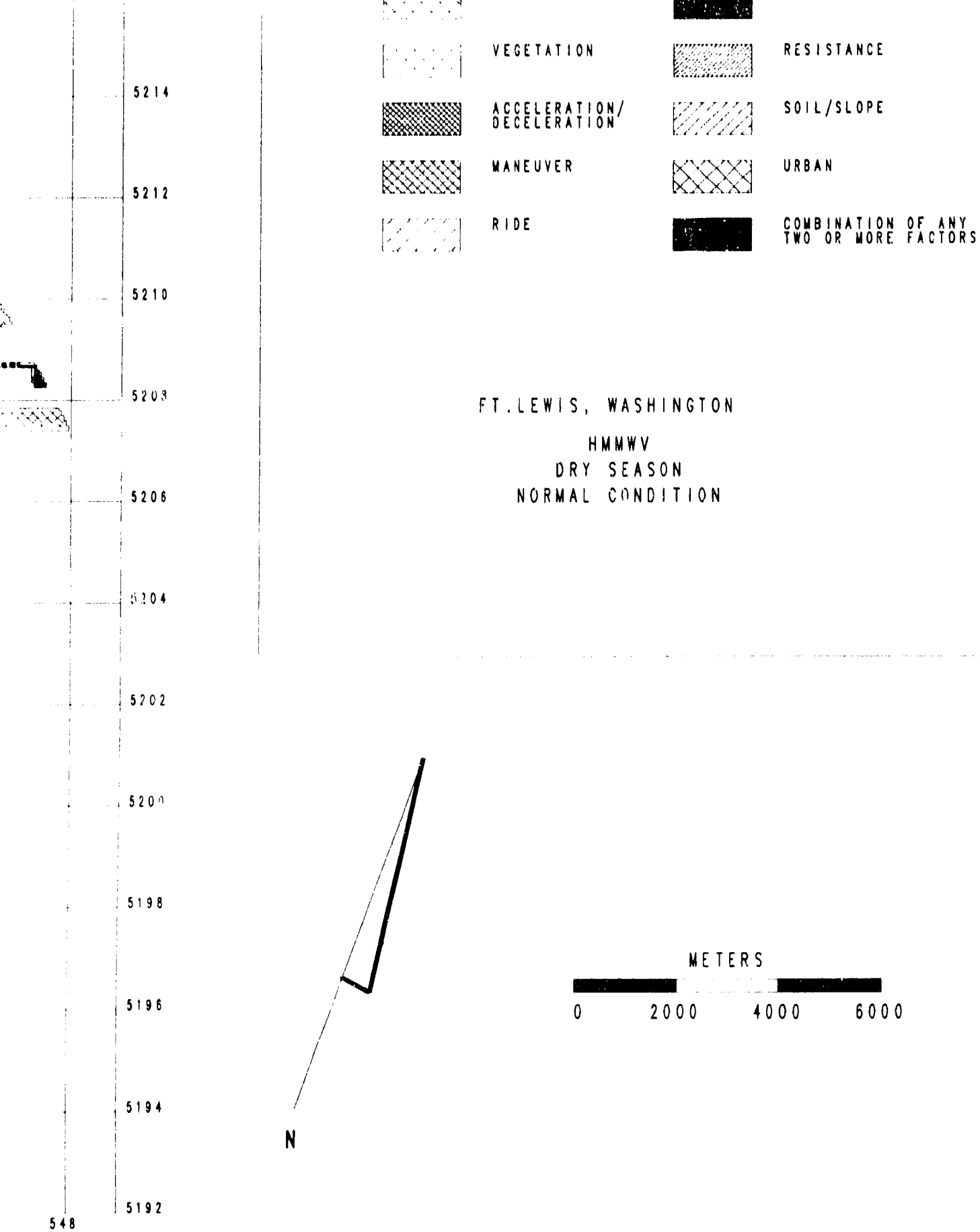


Plate 9. Speed limiting reason map for M998 (HMMWV) wheeled vehicle in the dry normal surface



normal surface condition

5224⁵¹⁴ 516 518 520 522 524 526 528 530 532 5

5222

5220

5218

5216

5214

5212

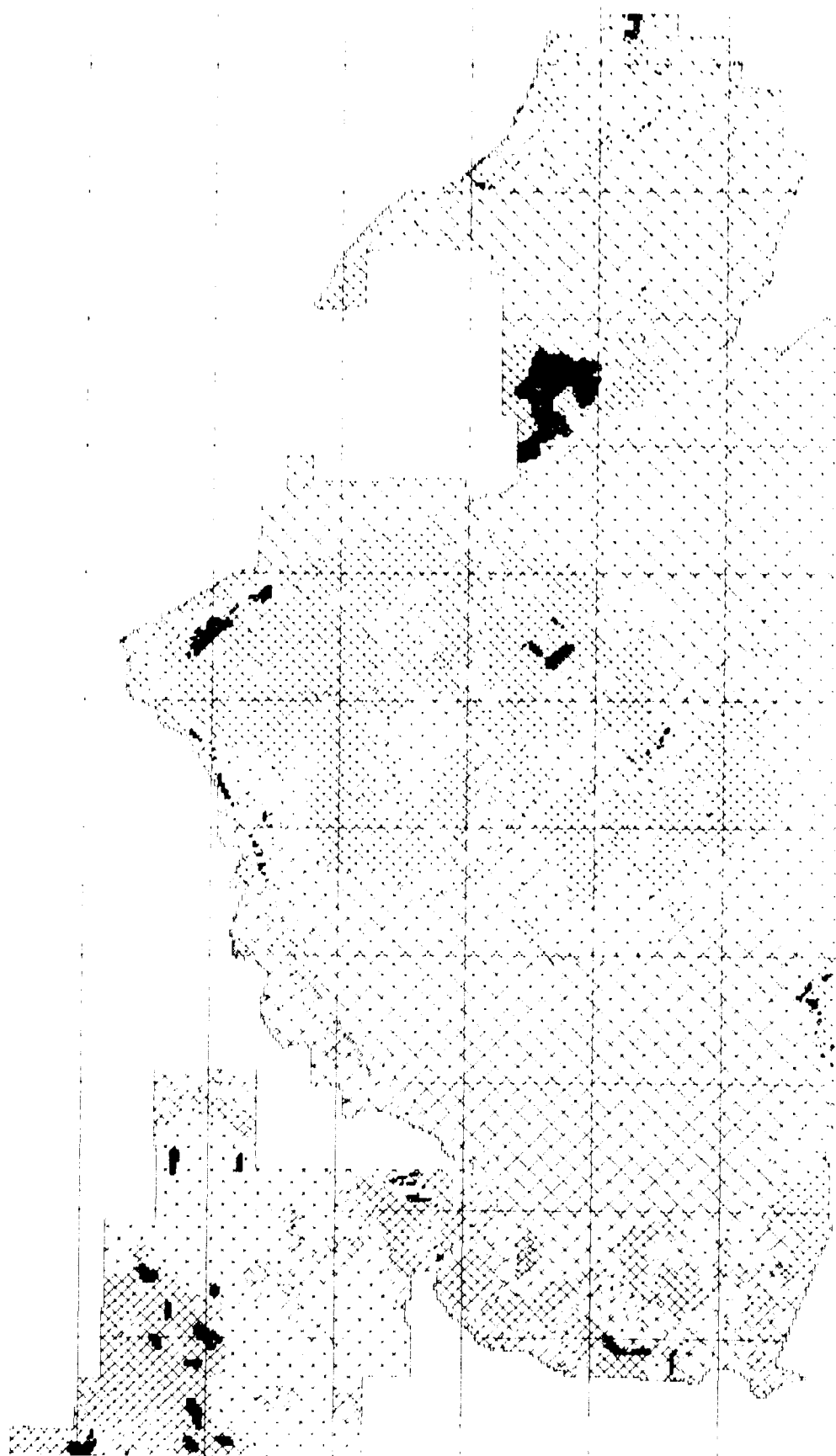
5210

5208

5206

5204

5202



526

528

530

532

534

536

538

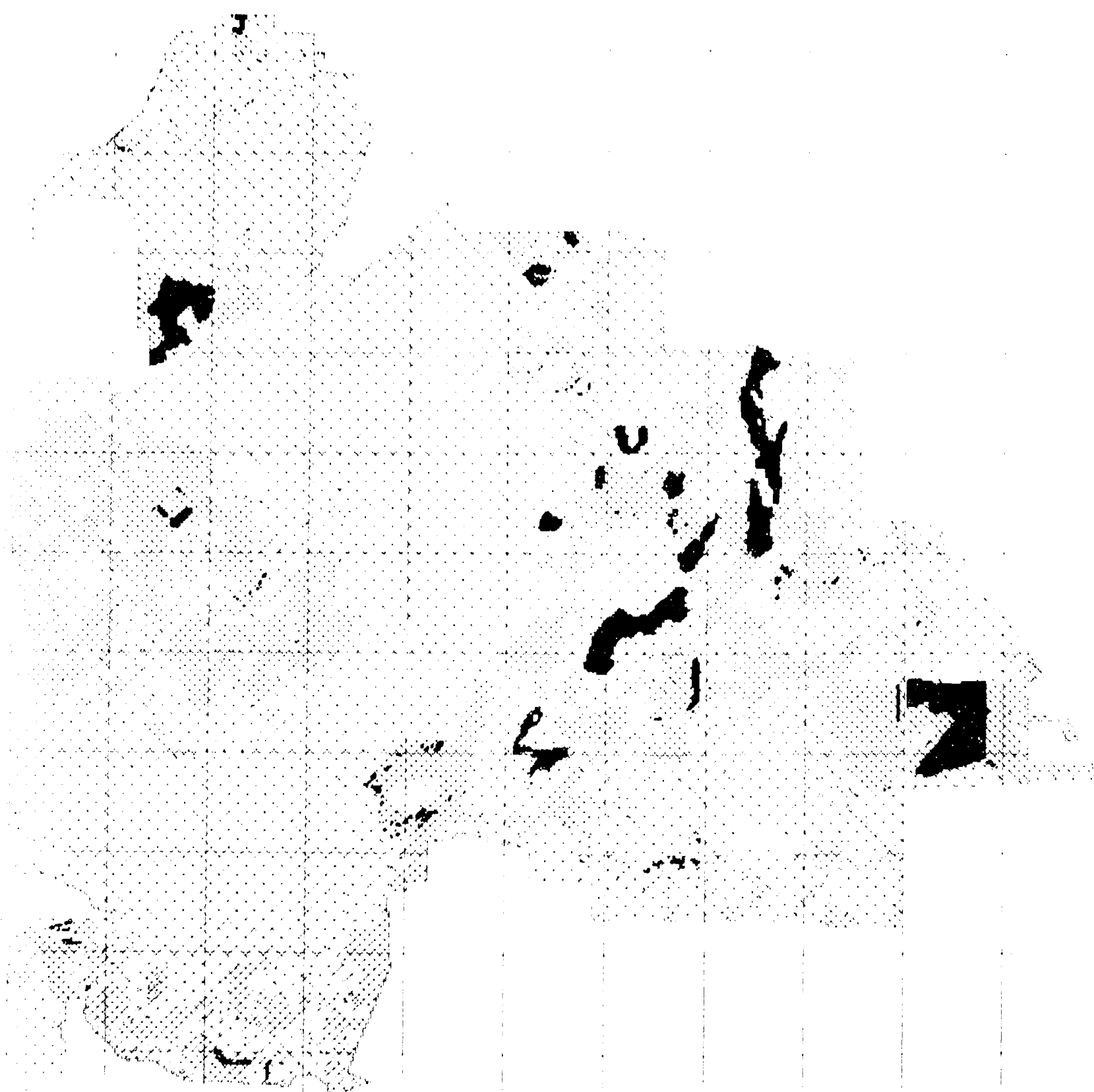
540

542

544

546

548



546

548

5224

5222

5220

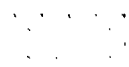


U. S. Army Corps of Engineers
Waterways
Experiment
Station

SPEED LIMITING REASON

SCALE 1:100000

5218



OBSTACLE



CONE INDEX

5216



VISIBILITY



TRACTION

VEGETATION



RESISTANCE

5214

ACCELERATION/
DECELERATION

SOIL/SLOPE

5212



MANEUVER



URBAN

RIDE

COMBINATION OF ANY
TWO OR MORE FACTORS

5210

5208

FT. LEWIS, WASHINGTON

8X8 WHEELED COMBAT VEHICLE

DRY SEASON

5206

NORMAL CONDITION

5204

5202

5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

5194

5192

514

516

518

520

522

524

526

528

530

532

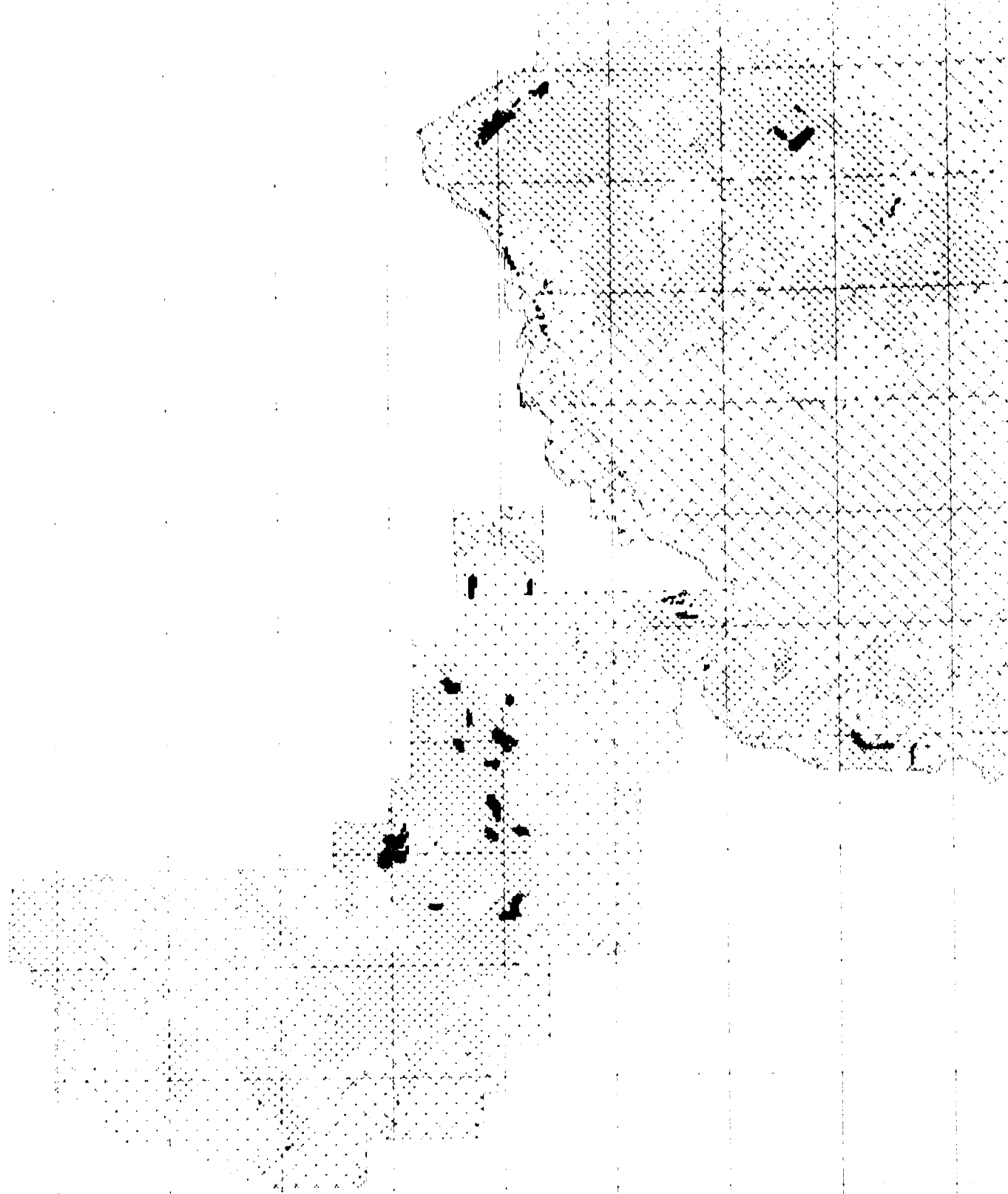
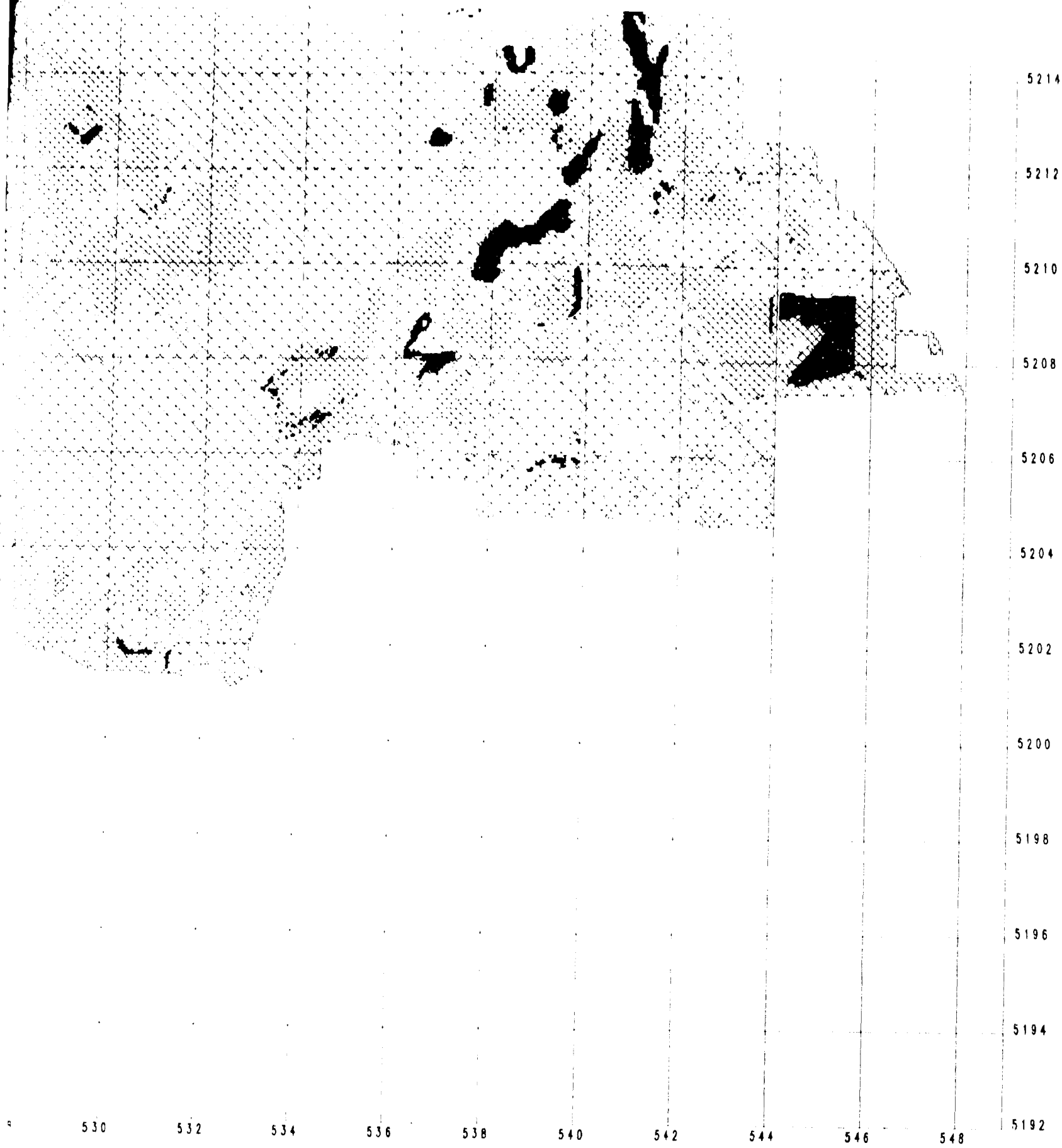


Plate 10. Speed limiting reasons



Speed limiting reason map for 8X8 wheeled combat vehicle in the dry normal surface conditio

5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

5194

5192

548

VEGETATION

ACCELERATION/
DECELERATION

MANEUVER

RIDE

RESISTANCE

SOIL/SLOPE

URBAN

COMBINATION OF ANY
TWO OR MORE FACTORS

FT. LEWIS, WASHINGTON

8X8 WHEELED COMBAT VEHICLE

DRY SEASON

NORMAL CONDITION

METERS

0 2000 4000 6000

N

al surface condition

5224⁵¹⁴

516

518

520

522

524

526

528

530

532

534

5222

5220

5218

5216

5214

5212

5210

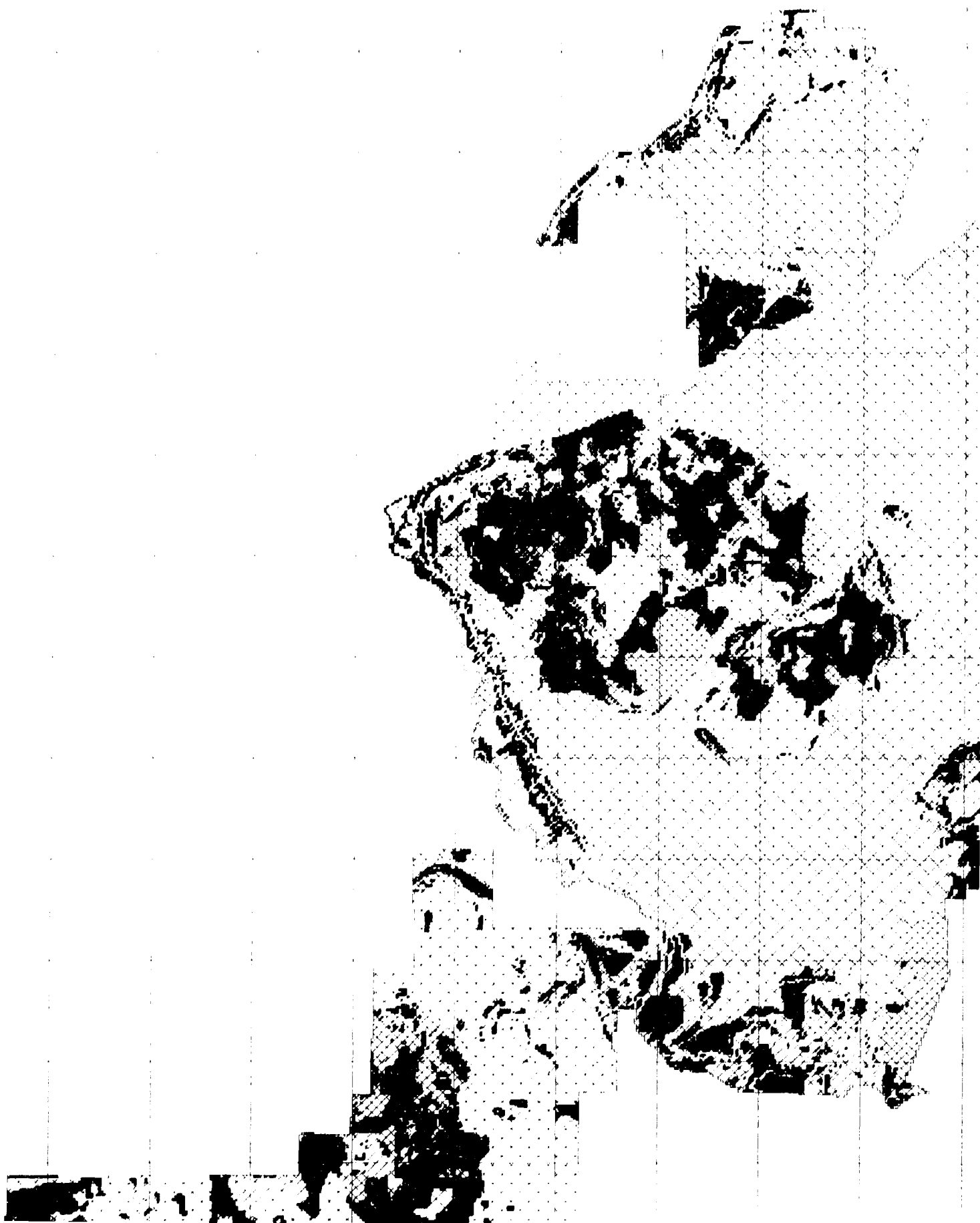
5208

5206

5204

5202

5200



528

530

532

534

536

538

540

542

544

546

548

5

5

5



546

548

5224

5222

5220



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SPEED LIMITING REASON

SCALE 1:100000



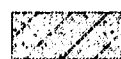
OBSTACLE



CONE INDEX



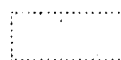
VISIBILITY



TRACTION



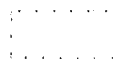
VEGETATION



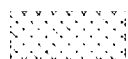
RESISTANCE



ACCELERATION/
DECELERATION



SOIL/SLOPE



MANEUVER



URBAN



RIDE



COMBINATION OF ANY
TWO OR MORE FACTORS

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200

FT. LEWIS, WASHINGTON

M60A3

DRY SEASON

NORMAL CONDITION

5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

5194

5192

514

516

518

520

522

524

526

528

530

532

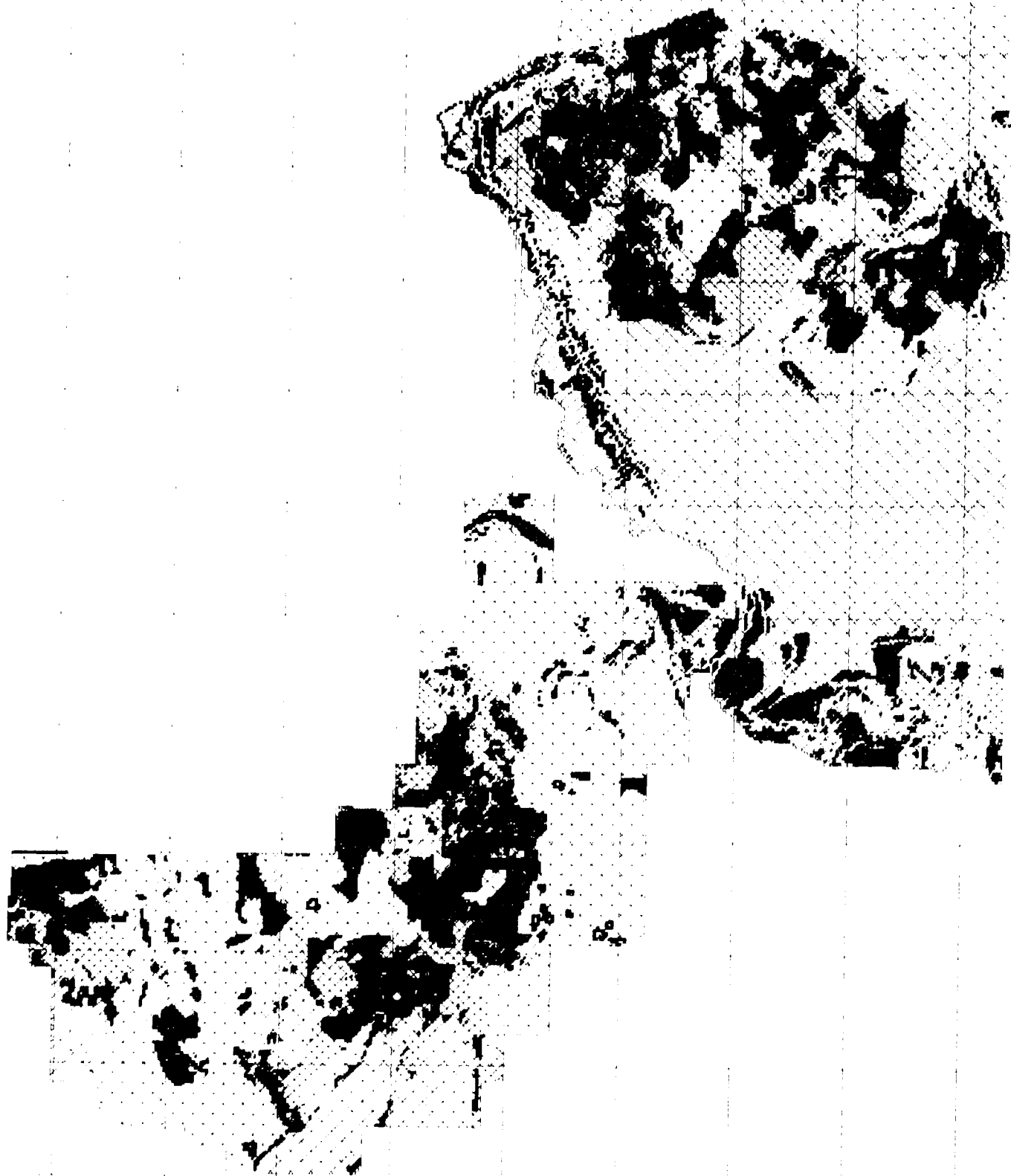
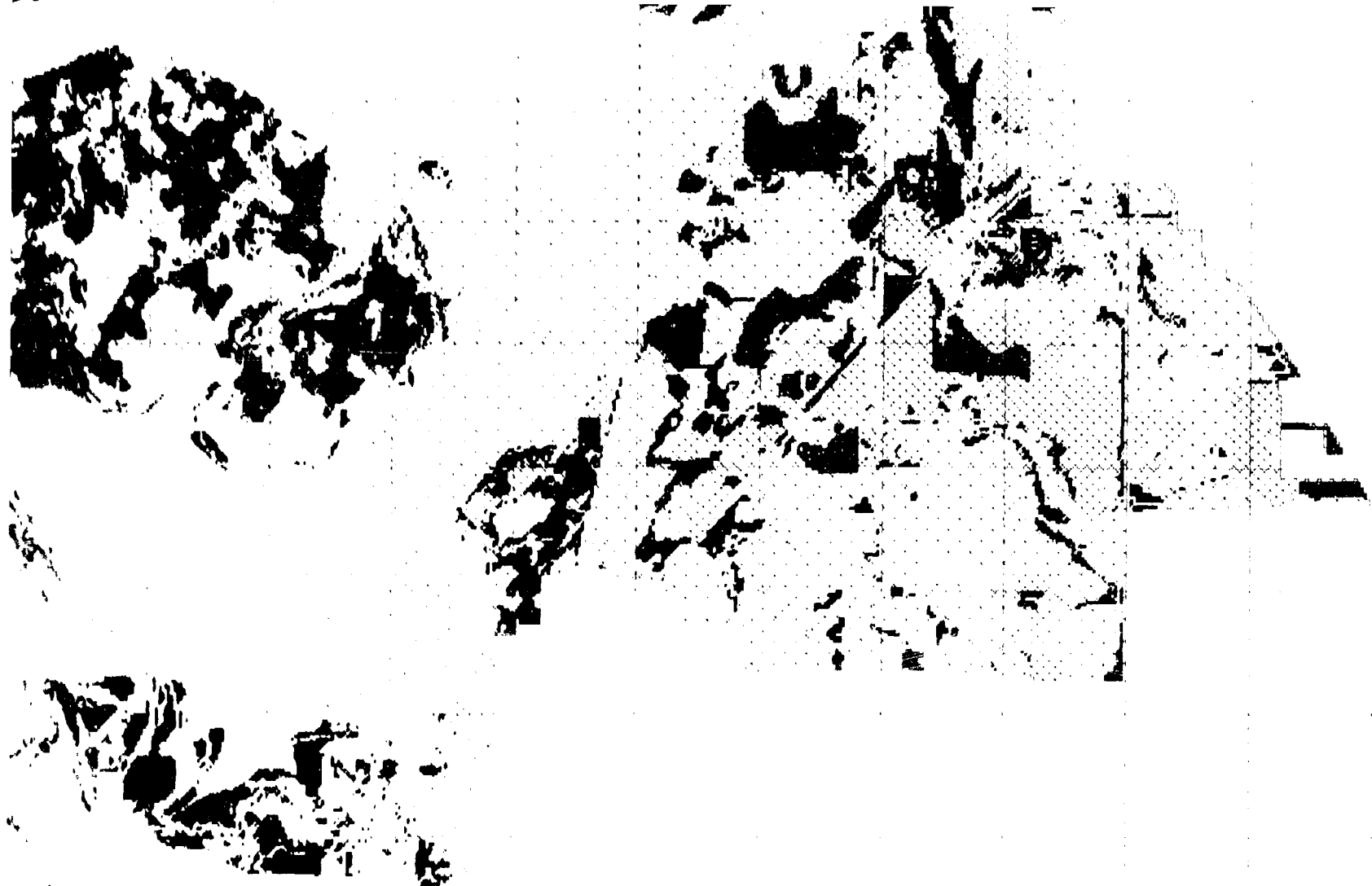


Plate 11. Speed limit



528 530 532 534 536 538 540 542 544 546 548

Plate 11. Speed limiting reason map for M60A3 combat tank in the dry normal surface c

5216

5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

5194

5192

548

VISIBILITY

VEGETATION

ACCELERATION/
DECELERATION

MANEUVER

RIDE

TRACTION

RESISTANCE

SOIL/SLOPE

URBAN

COMBINATION OF ANY
TWO OR MORE FACTORS

FT. LEWIS, WASHINGTON

M60A3

DRY SEASON

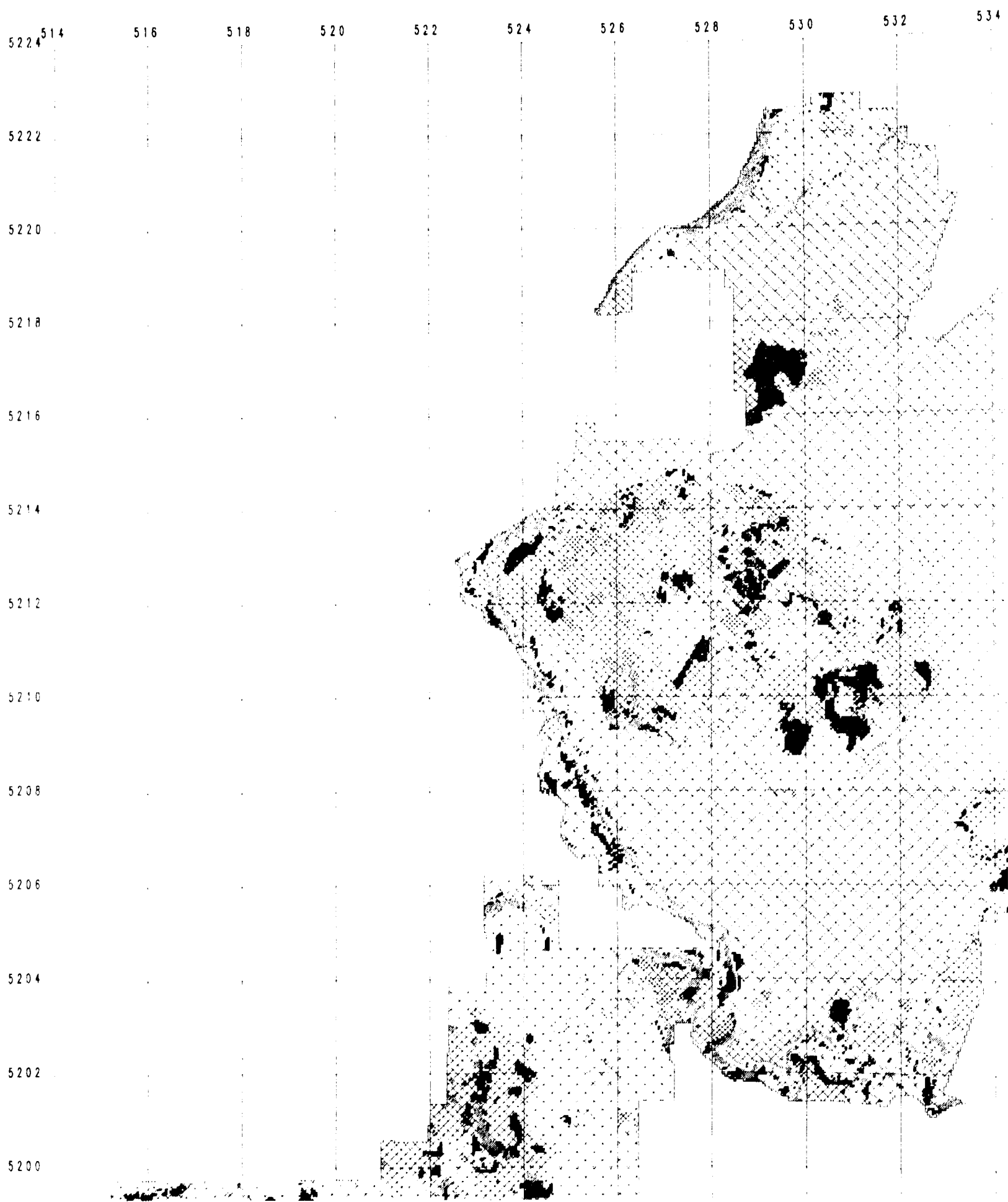
NORMAL CONDITION

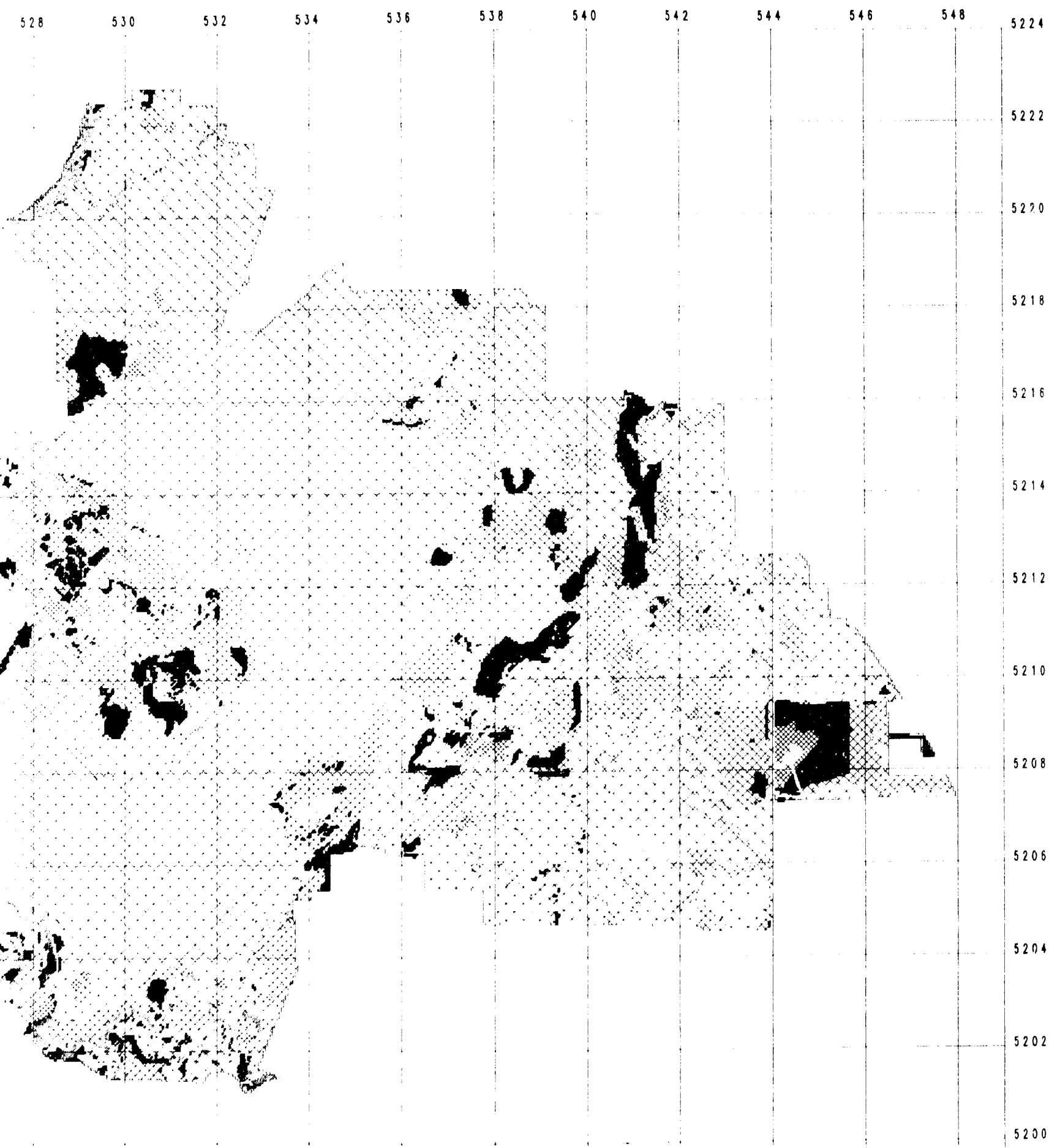
N

METERS

0 2000 4000 6000

surface condition





5224

5222

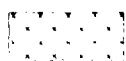
5220



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SPEED LIMITING REASON

SCALE 1:100000



OBSTACLE



CONE INDEX



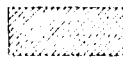
VISIBILITY



TRACTION



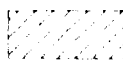
VEGETATION



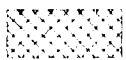
RESISTANCE



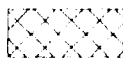
ACCELERATION/
DECELERATION



SOIL/SLOPE



MANEUVER



URBAN



RIDE



COMBINATION OF ANY
TWO OR MORE FACTORS

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200

FT. LEWIS, WASHINGTON

HMMWV

WET SEASON

SLIPPERY CONDITION

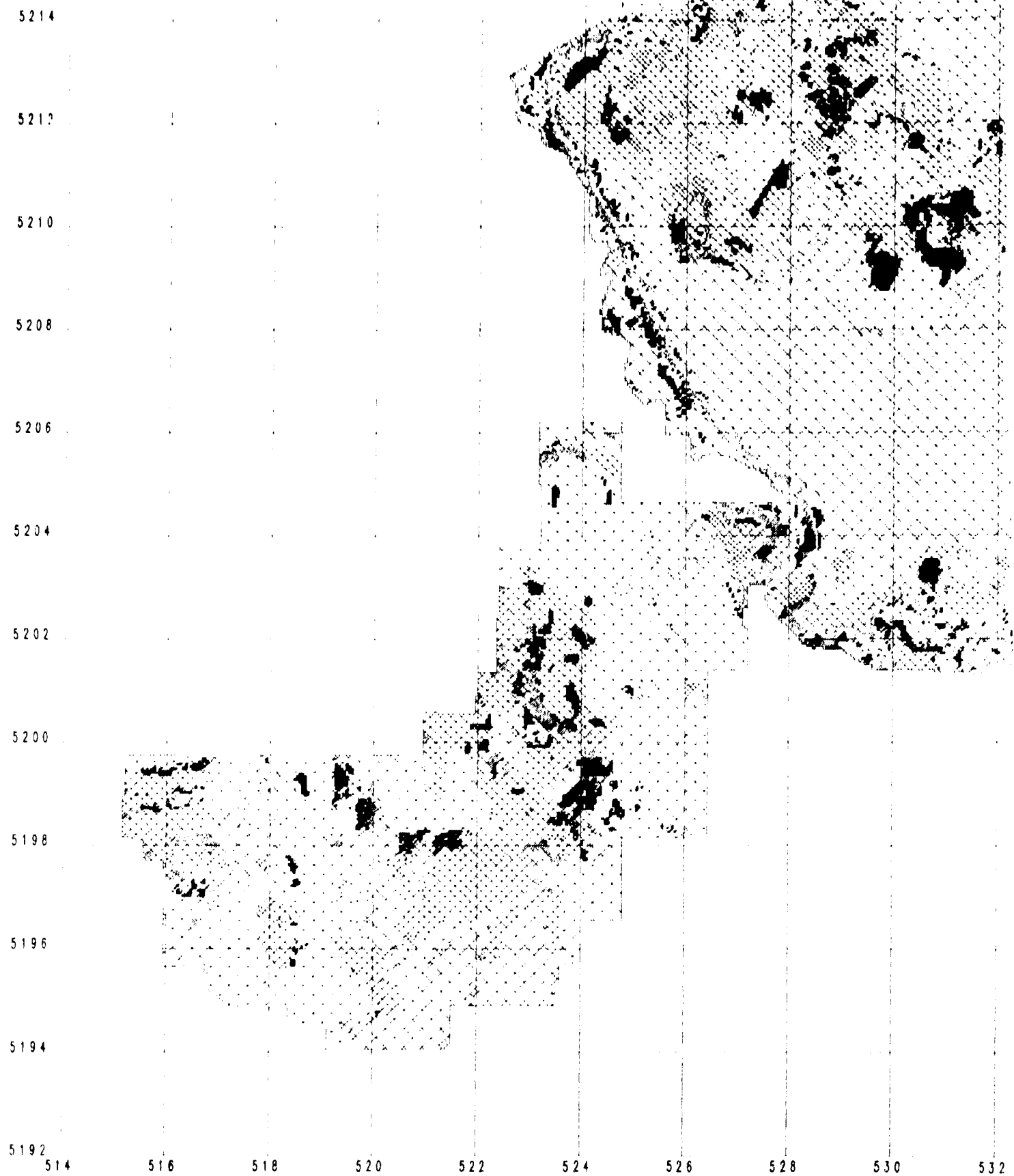
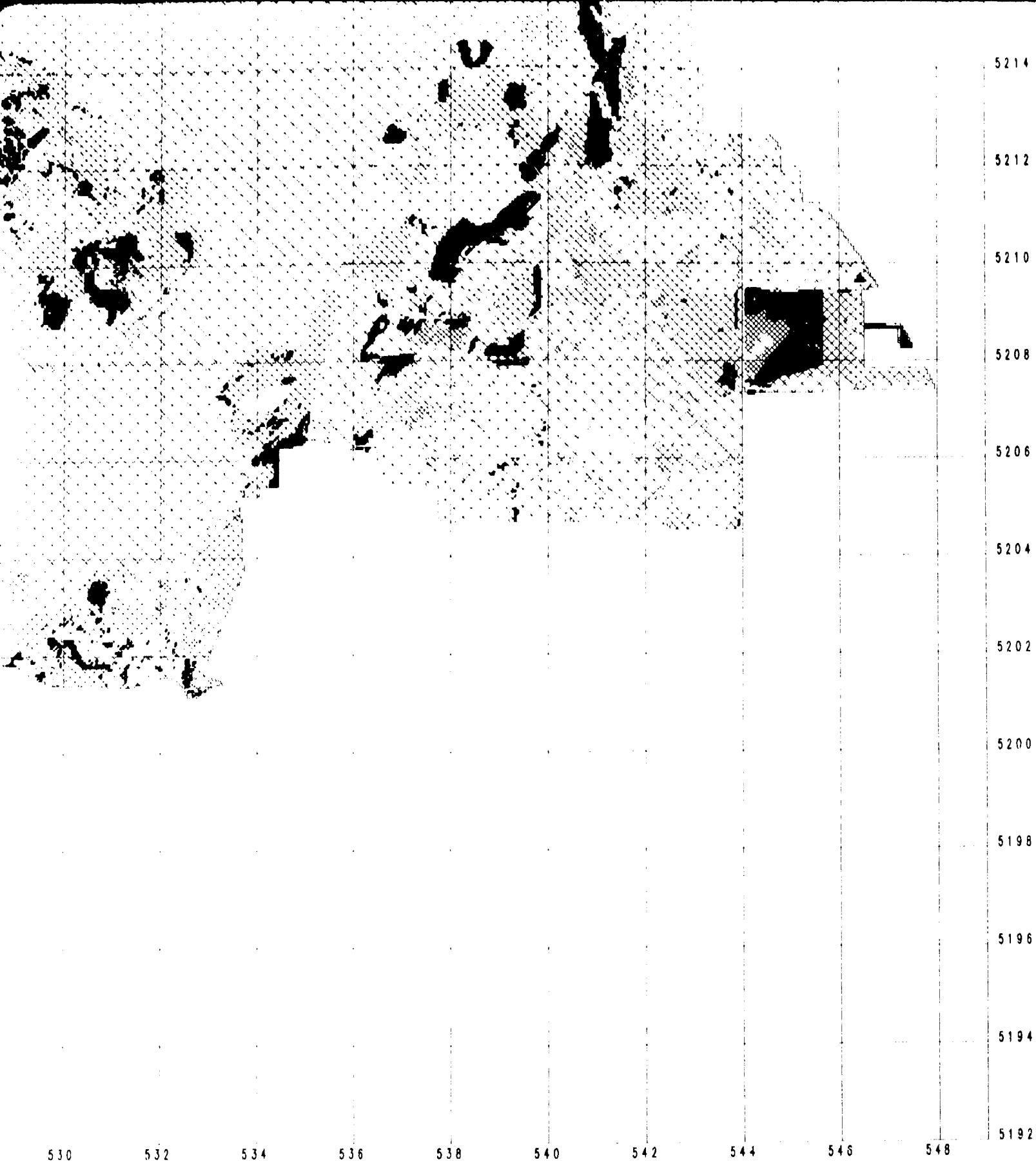


Plate 12. Speed limiting reasons



limiting reason map for M998 (HMMWV) wheeled vehicle in the wet slippery surface condit

5216

VISIBILITY

TRACTION

VEGETATION

RESISTANCE

5214

ACCELERATION/
DECELERATION

SOIL/SLOPE

5212

MANEUVER

URBAN

RIDE

COMBINATION OF ANY
TWO OR MORE FACTORS

5210

5208

FT. LEWIS, WASHINGTON

MMWV

WET SEASON

5206

SLIPPERY CONDITION

5204

5202

5200

5198

5196

5194

5192

N

METERS

0 2000 4000 6000

t slippery surface condition

5224⁵¹⁴ 516 518 520 522 524 526 528 530 532 534

5222

5220

5218

5216

5214

5212

5210

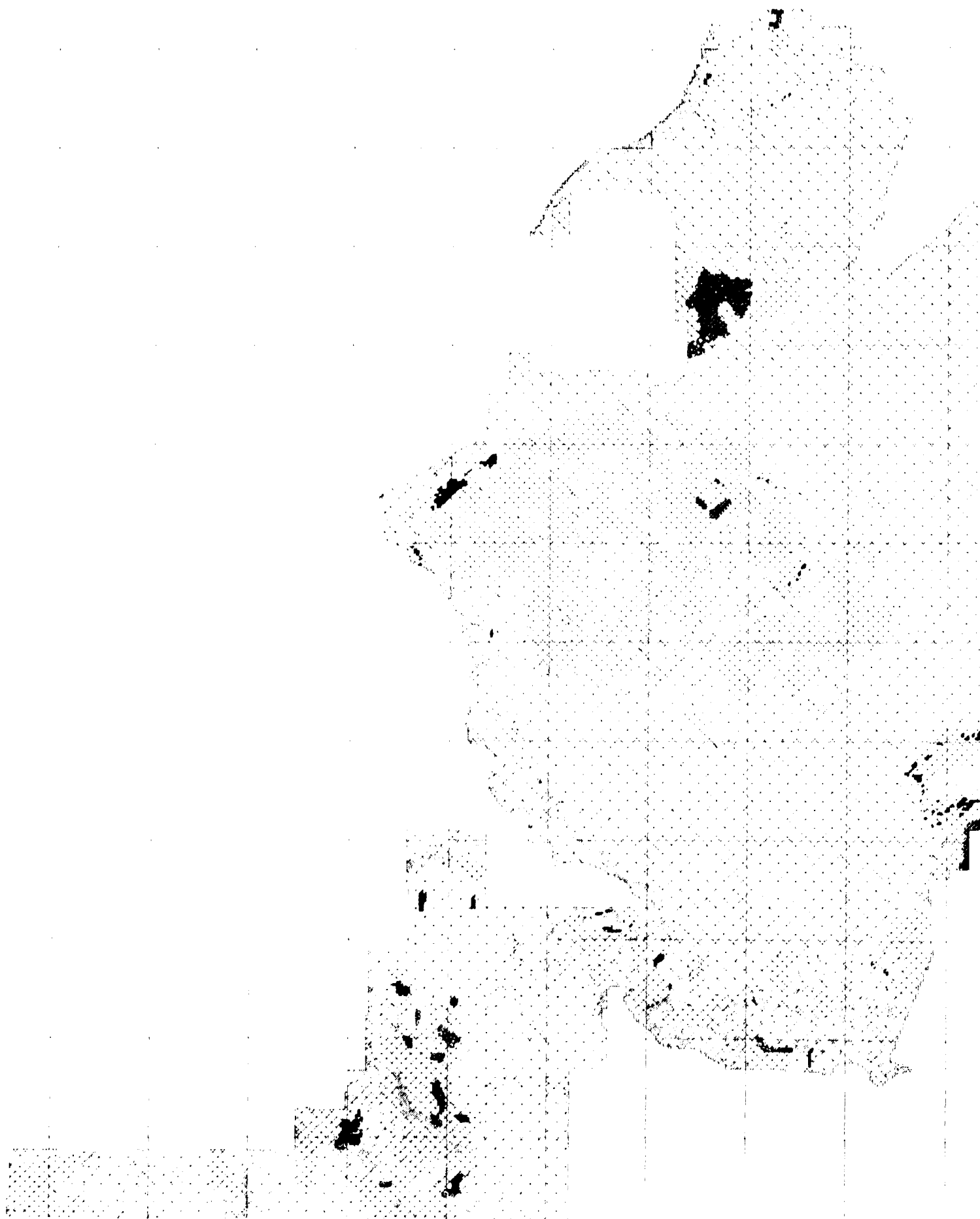
5208

5206

5204

5202

5200



526

528

530

532

534

536

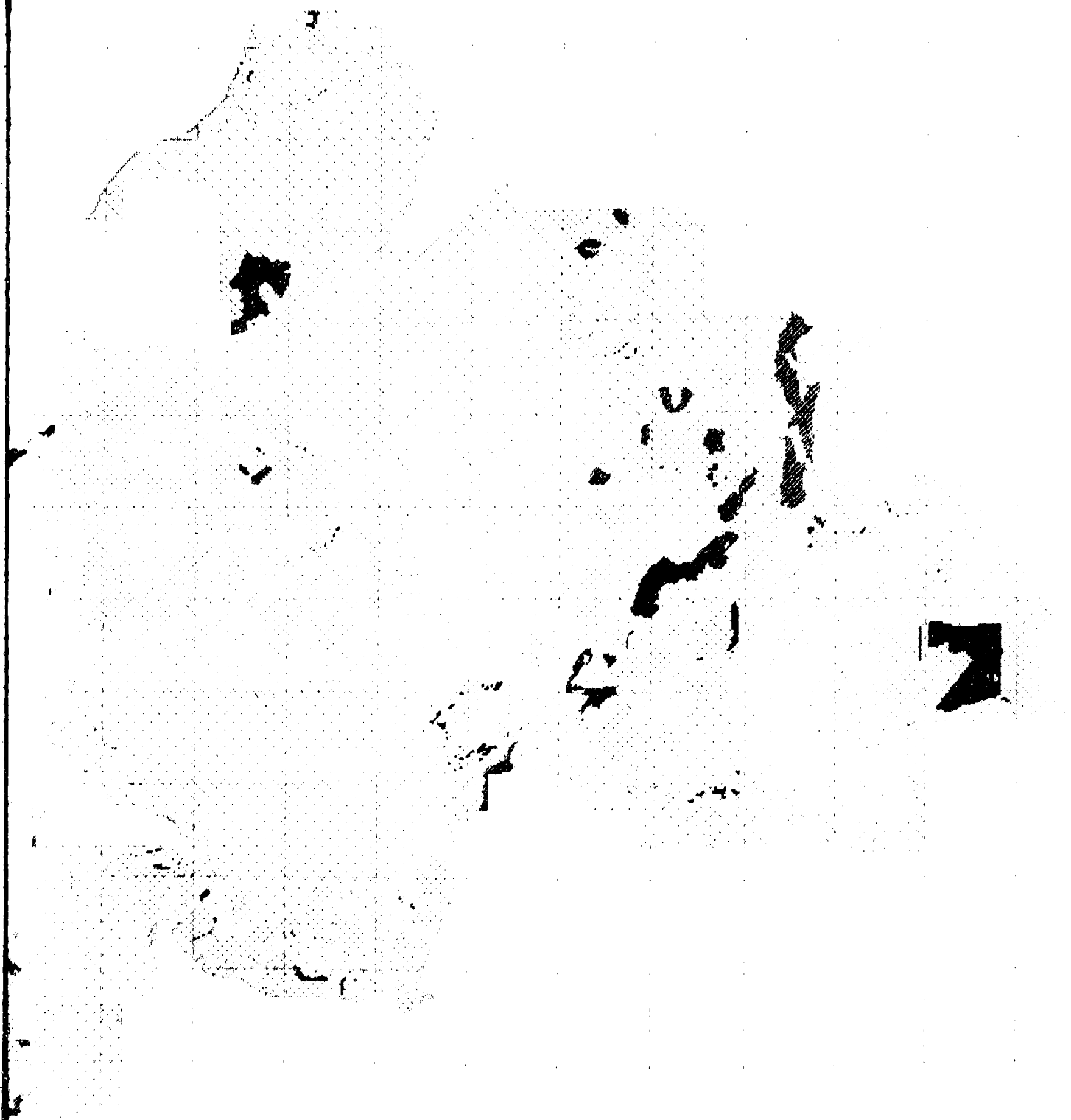
538

540

542

544

546



546

548

5224

5222

5220



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SPEED LIMITING REASON

SCALE 1:100000

5218

OBSTACLE



CONE INDEX

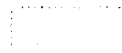
5216

VISIBILITY



TRACTION

VEGETATION



RESISTANCE

5214

ACCELERATION/
DECELERATION



SOIL/SLOPE

5212

MANEUVER



URBAN

RIDE



COMBINATION OF ANY
TWO OR MORE FACTORS

5210

5208

FT. LEWIS, WASHINGTON

8X8 WHEELED COMBAT VEHICLE

WET SEASON

5206

SLIPPERY CONDITION

5204

5202

5200

5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

5194

5192
514

516

518

520

522

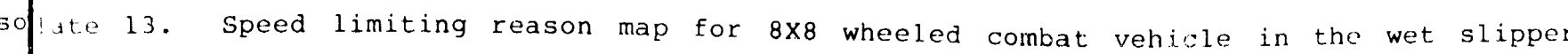
524

526

528

530

Plate 13. Speed limiting r



5214
5212
5210
5208
5206
5204
5202
5200
5198
5196
5194
5192

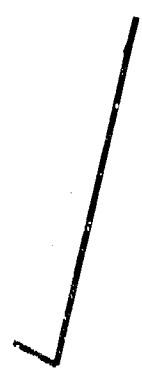


VEGETATION
ACCELERATION/
DECELERATION
MANEUVER
RIDE

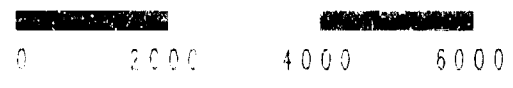


RESISTANCE
SOIL/SLOPE
URBAN
COMBINATION OF ANY
TWO OR MORE FACTORS

FT. LEWIS, WASHINGTON
8X8 WHEELED COMBAT VEHICLE
WET SEASON
SLIPPERY CONDITION



METERS



N

546 548

set slippery surface condition

524
5224

525

526

527

528

529

530

531

532

533

524

525

526

527

528

529

530

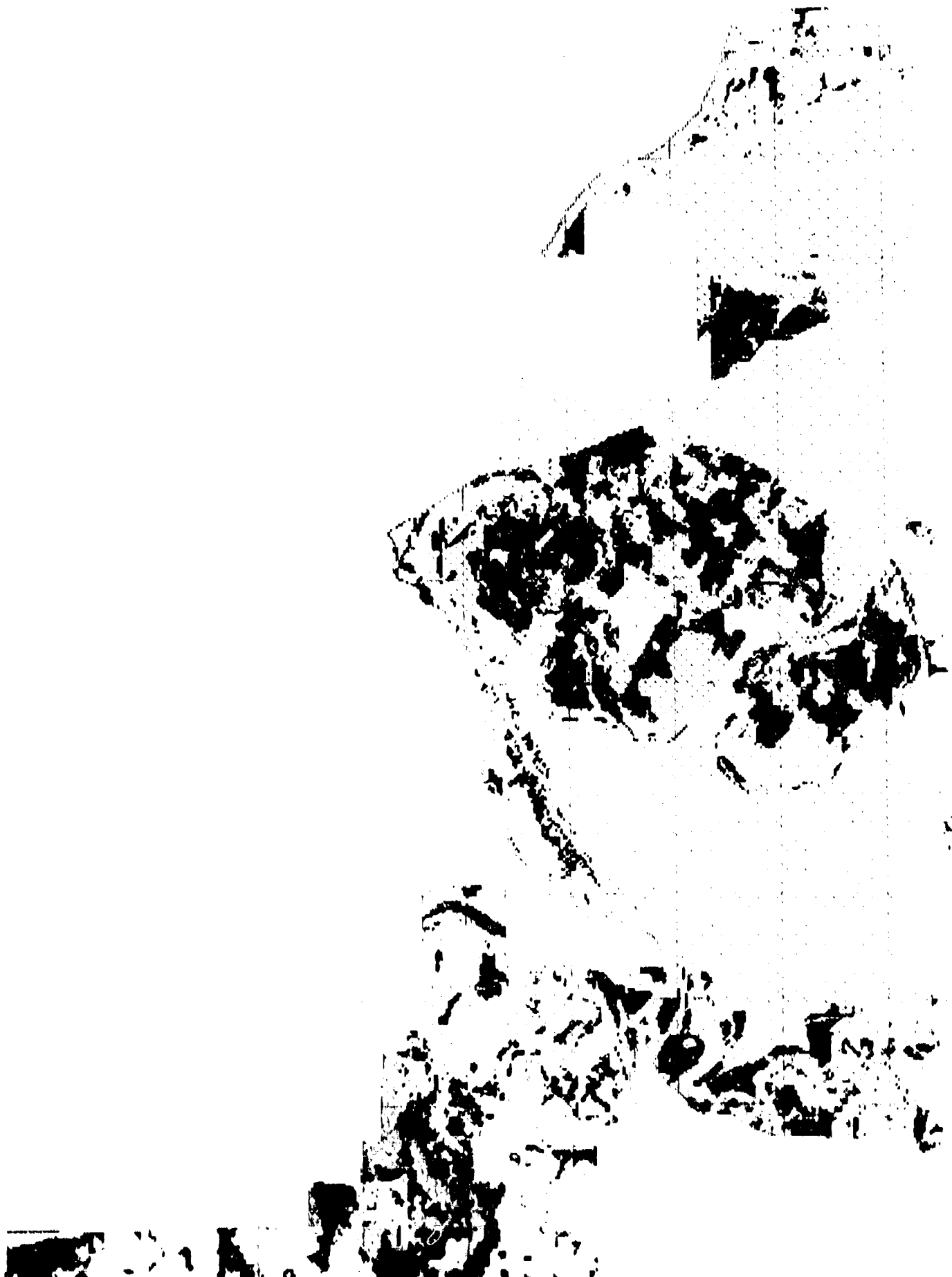
531

532

533

534

535



526

528

530

532

534

536

538

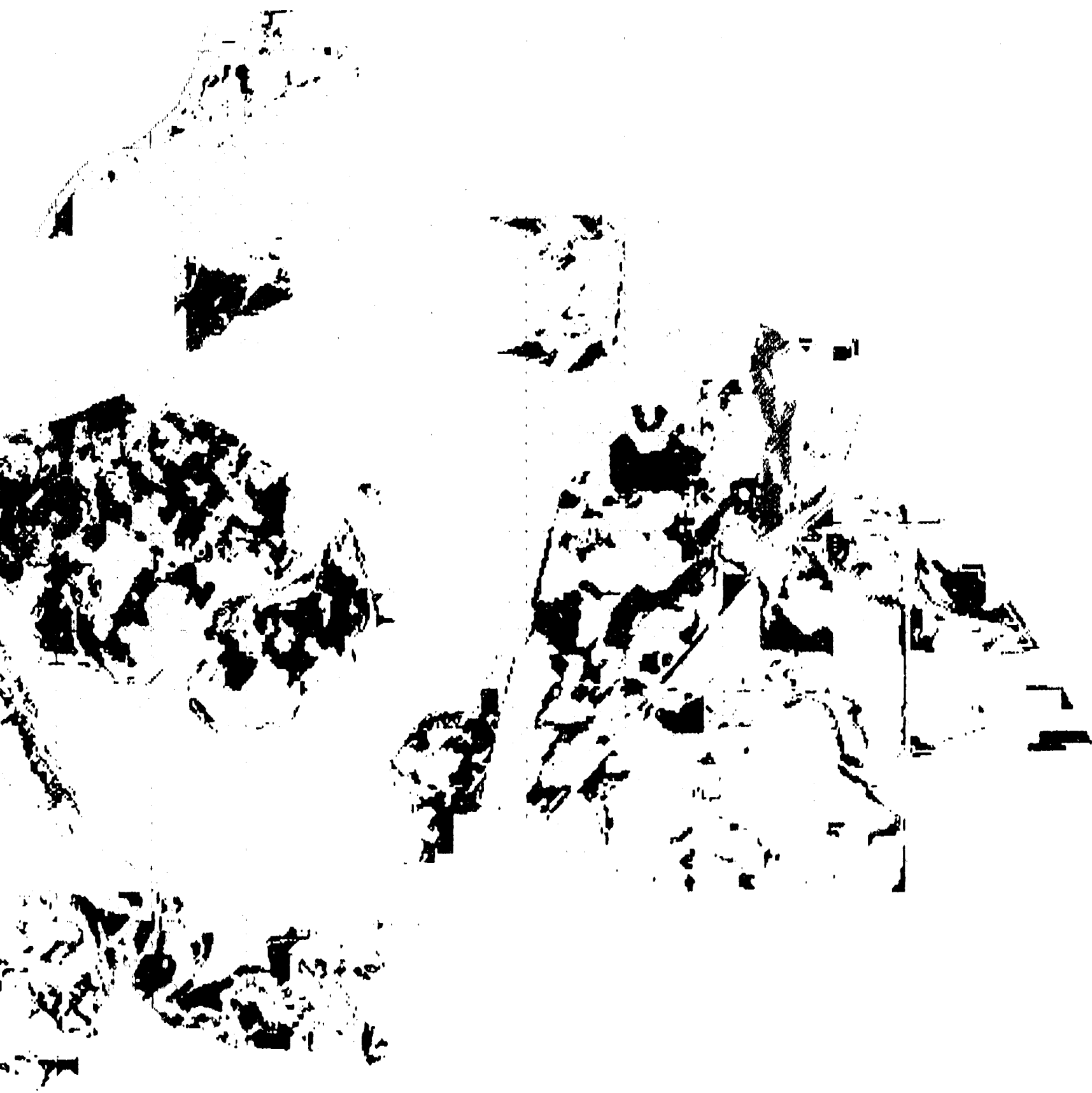
540

542

544

546

548



546

548

5224



U. S. Army Corps of Engineers
Waterways
Experiment
Station

5222

5220

SPEED LIMITING REASON

SCALE 1:100000

5218

OBSTACLE

CONCRETE INDEX

5215

VISIBILITY

TRACTION

VEGETATION

RESISTANCE

5214

ACCELERATION/
DECELERATION

SOIL/SLOPE

MANEUVER

URBAN

5212

RIDE

COMBINATION OF ANY
TWO OR MORE FACTORS

5210

5208

FT LEWIS, WASHINGTON

M60A3

WET SEASON

5206

SLIPPERY CONDITION

5204

5202

5200

5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

5194

5192
514

516

518

520

522

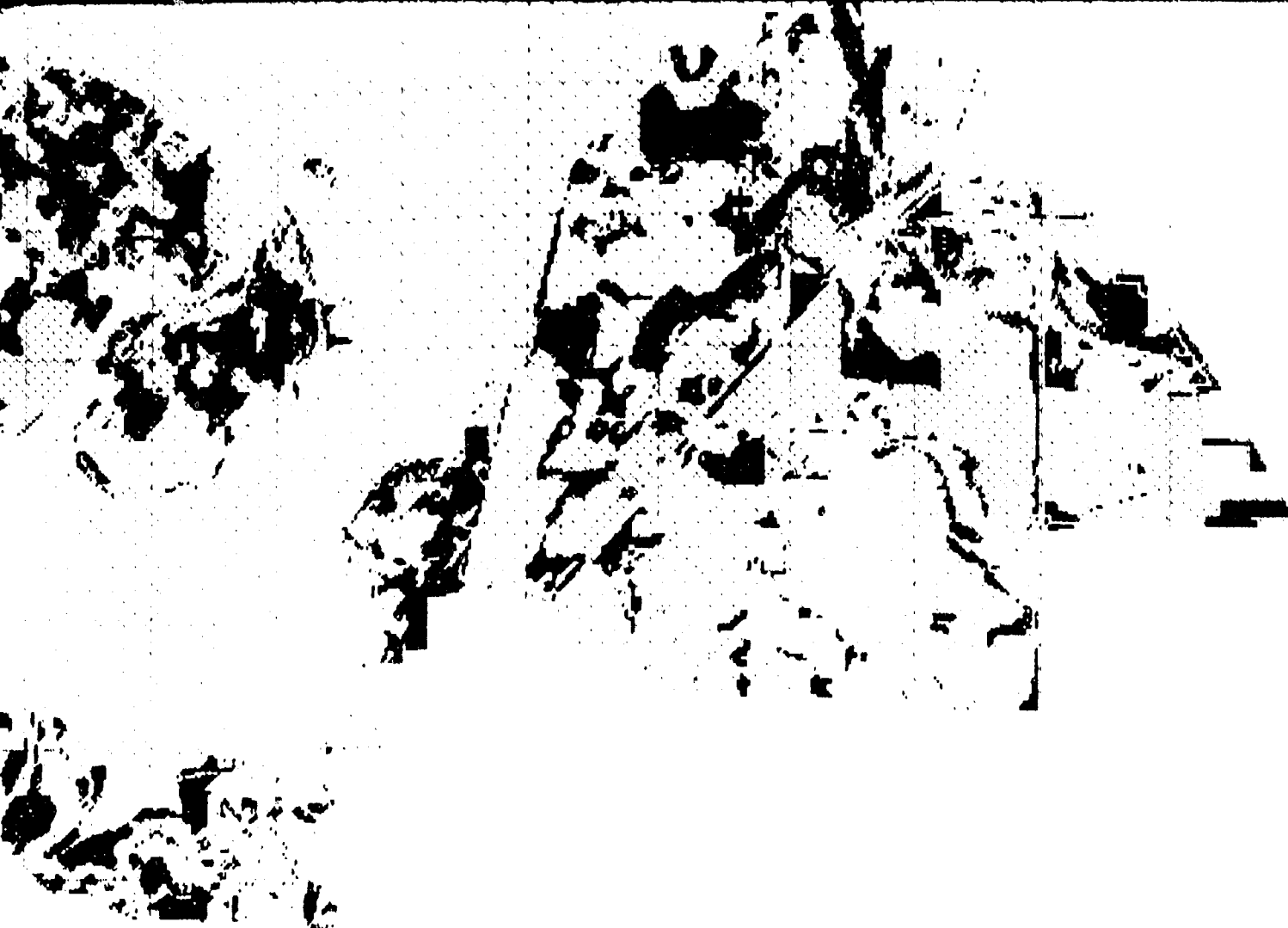
524

526

528

530

plate 14. Speed



5214
5212
5210
5208
5206
5204
5202
5200
5198
5196
5194
5192

530 532 534 536 538 540 542 544 546 548

Figure 14. Speed limiting reason map for M60A3 combat tank in the wet slippery surface condition

VEGETATION

RESISTANCE

5214



ACCELERATION/
DECELERATION

SOIL/SLOPE

5212



MANEUVER

URBAN

RIDE



COMBINATION OF ANY
TWO OR MORE FACTORS

521

5208

FT. LEWIS, WASHINGTON

M60A3

WET SEASON

5206

SLIPPERY CONDITION

5204

5202

5200

5198

5196

METERS

0

2000

4000

6000

5194

N

5192

549

ly surface condition

5224⁵¹⁴

516

518

520

522

524

526

528

530

5

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200

524

526

528

530

532

534

536

538

540

542

544



544

546

548

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL DISTURBANCE LEVELS

SCALE 1:100000



NOGG



HIGH
(>5-12 in)



MINIMUM
(0-.5 in)



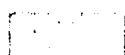
SEVERE
(>12 in)



SLIGHT
(.5-2 in)



URBAN/
OFF LIMITS



MODERATE
(2-5 in)

WATER

FT LEWIS, WASHINGTON

3-3-5 FORCE STRUCTURE

DRY SEASON

NORMAL CONDITION

10 PASSES

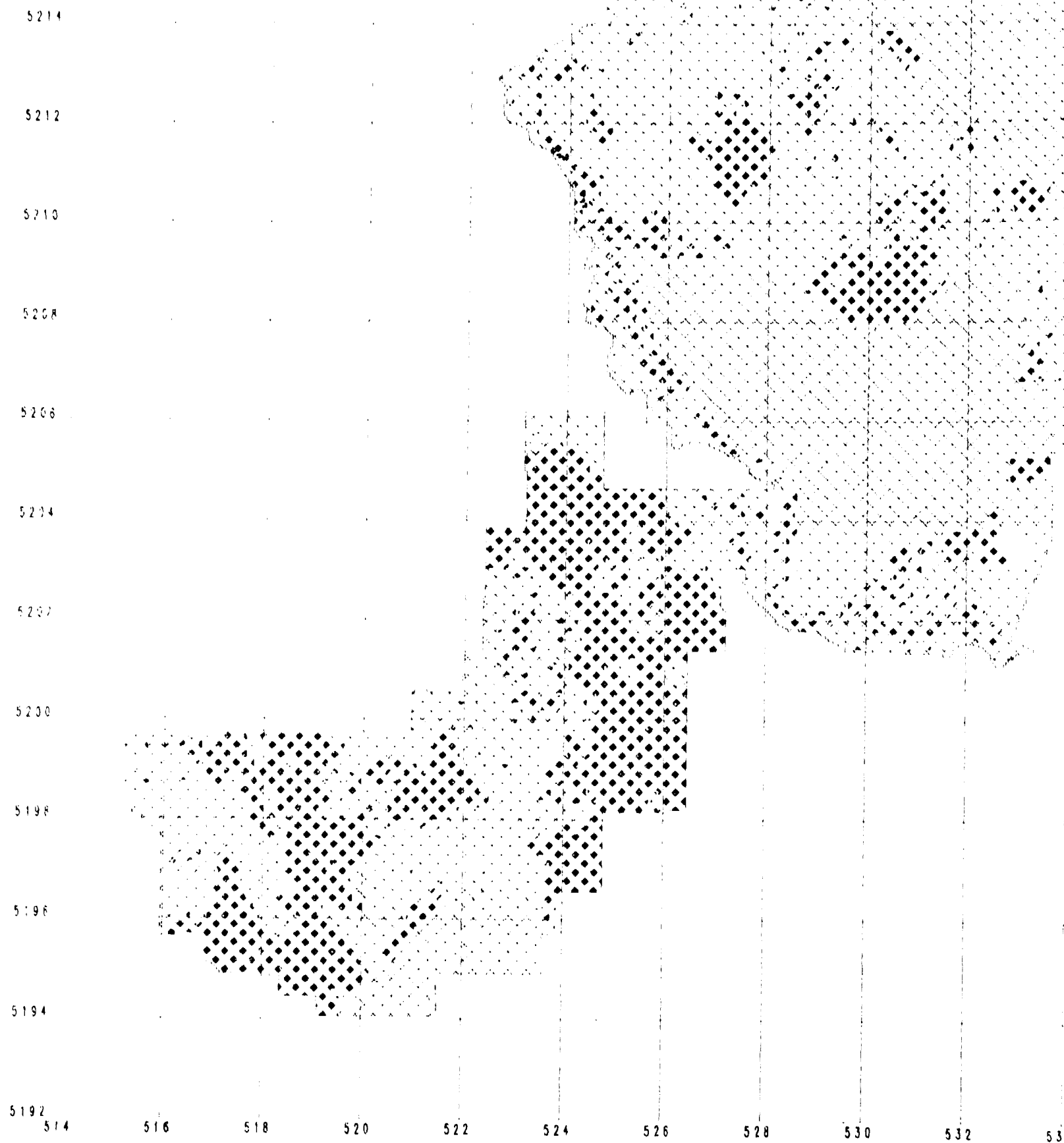
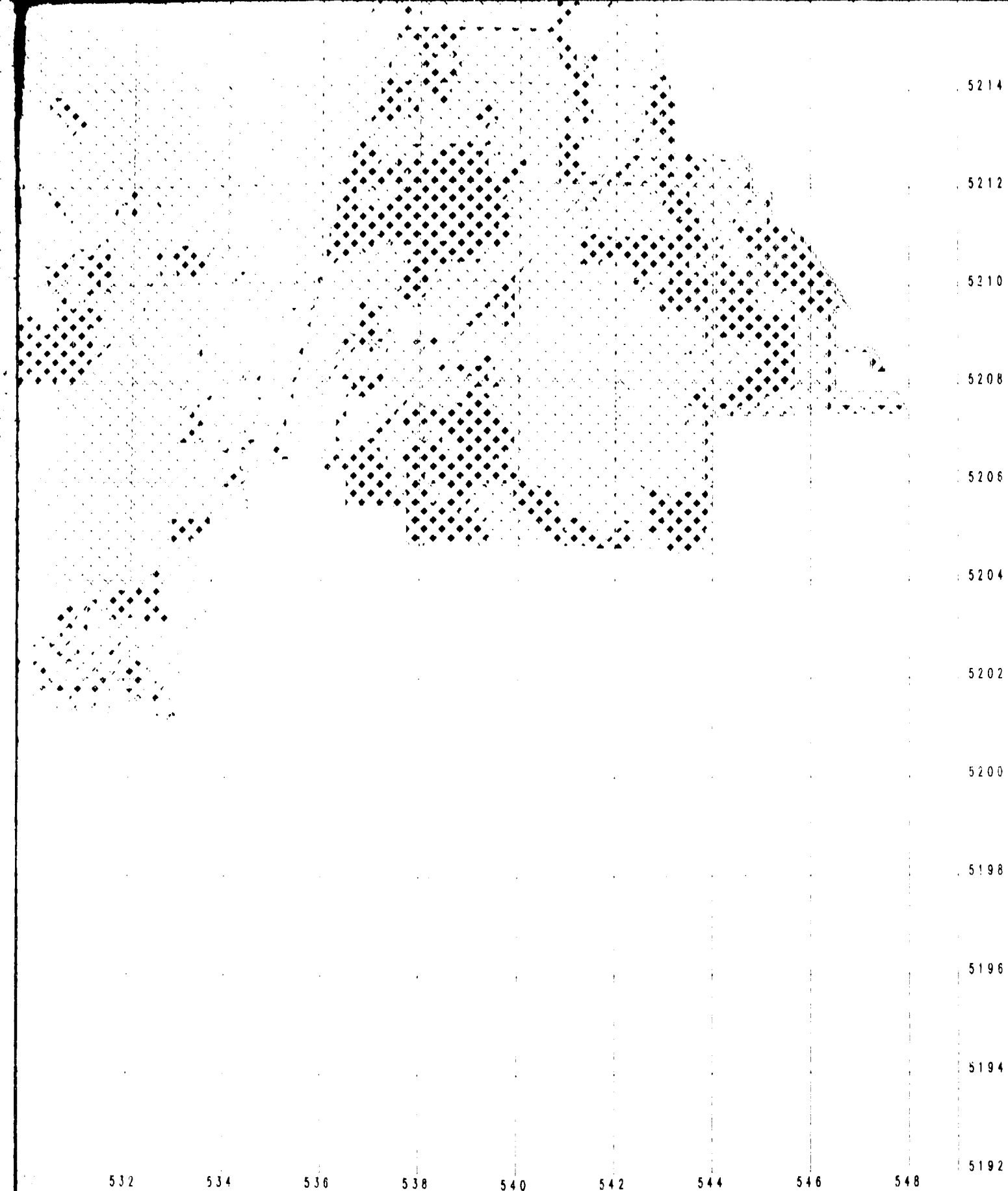


Plate 15. Ten pass soil disturbance level map for



Force level map for 3-3-5 and 4-3-3 (HMMWV) force structures in the dry normal surface condition

SLIGHT
(.5-2 in)

URBAN/
OFF LIMITS

MODERATE
(2-5 in)

WATER

5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

5194

5192

FT LEWIS, WASHINGTON
3-3-5 FORCE STRUCTURE
DRY SEASON
NORMAL CONDITION
10 PASSES

METERS

0 2000 4000 6000

N

548

dry normal surface condition

5224⁵¹⁴

516

518

520

522

524

526

528

530

532

534

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200



526

528

530

532

534

536

538

540

542

544

546

548



546 548

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200

5198



U. S. Army Corps of Engineers Waterways Experiment Station

SOIL DISTURBANCE LEVELS

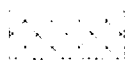
SCALE 1:100000



NOGO



HIGH
(>5-12 in)



MINIMUM
(0-.5 in)



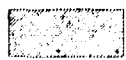
SEVERE
(>12 in)



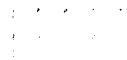
SLIGHT
(.5-2 in)



URBAN/
OFF LIMITS



MODERATE
(2-5 in)



WATER

FT LEWIS, WASHINGTON

3-3-5 FORCE STRUCTURE

DRY SEASON

NORMAL CONDITION

50 PASSES

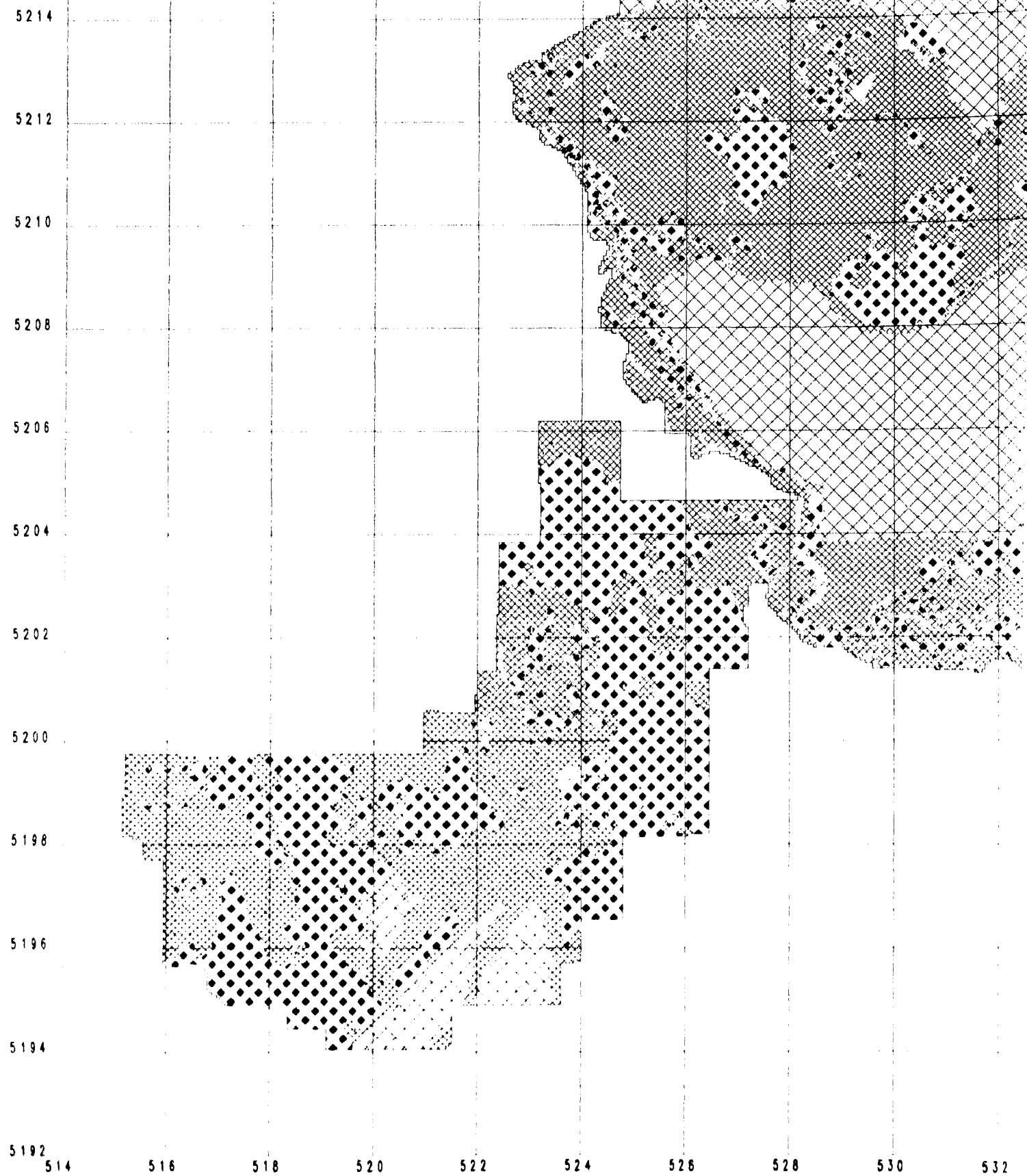
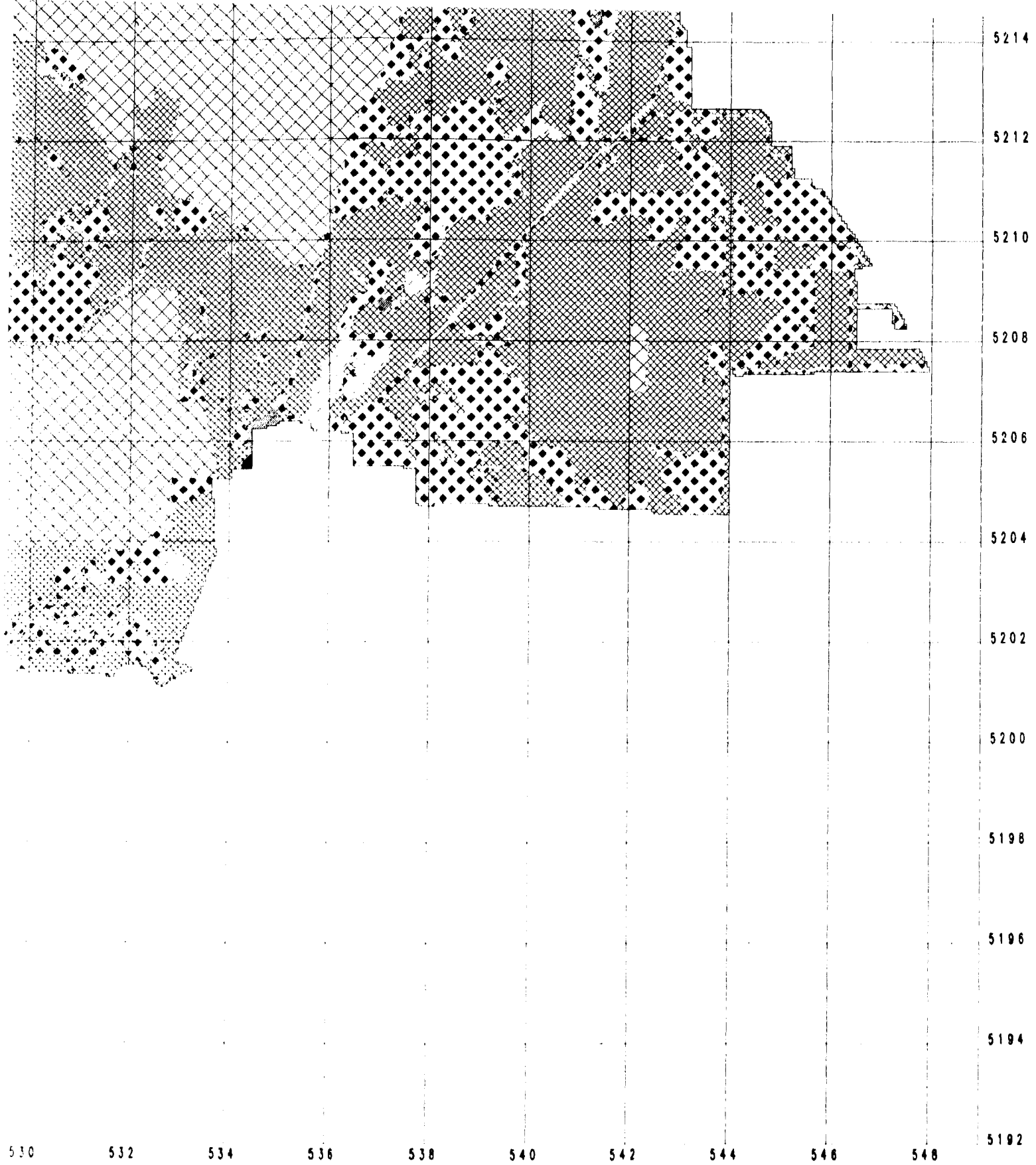
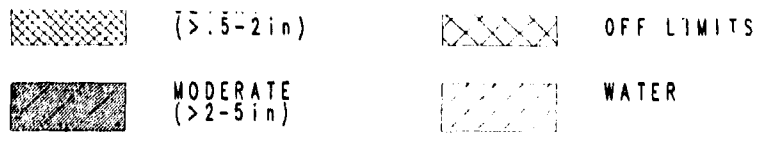
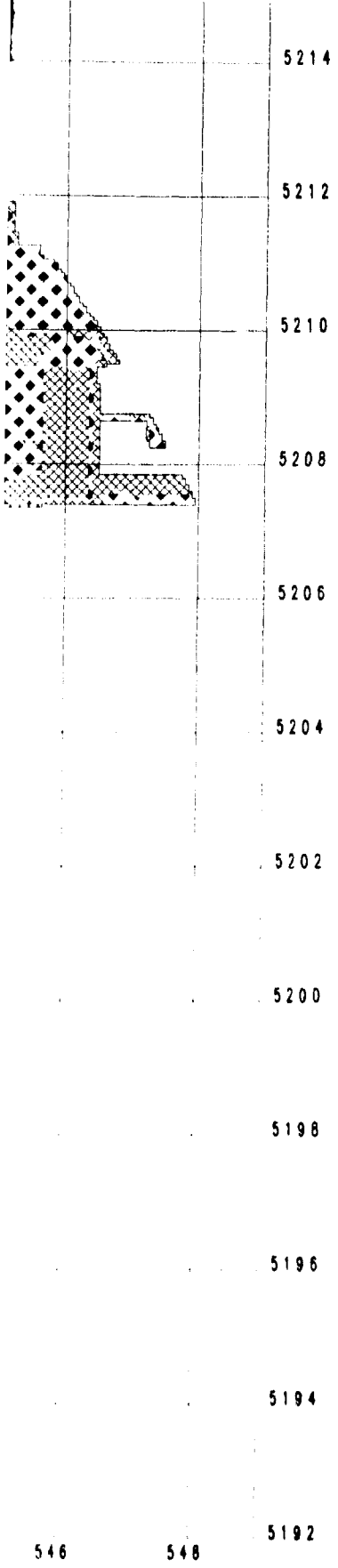


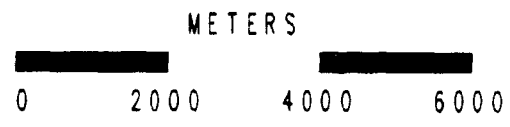
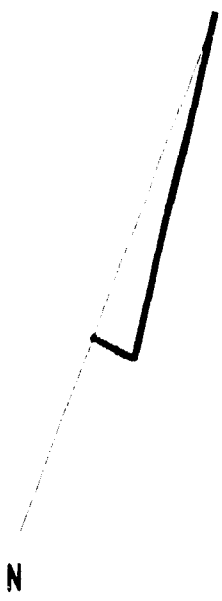
Plate 16. Fifty pass soil disturbance leve



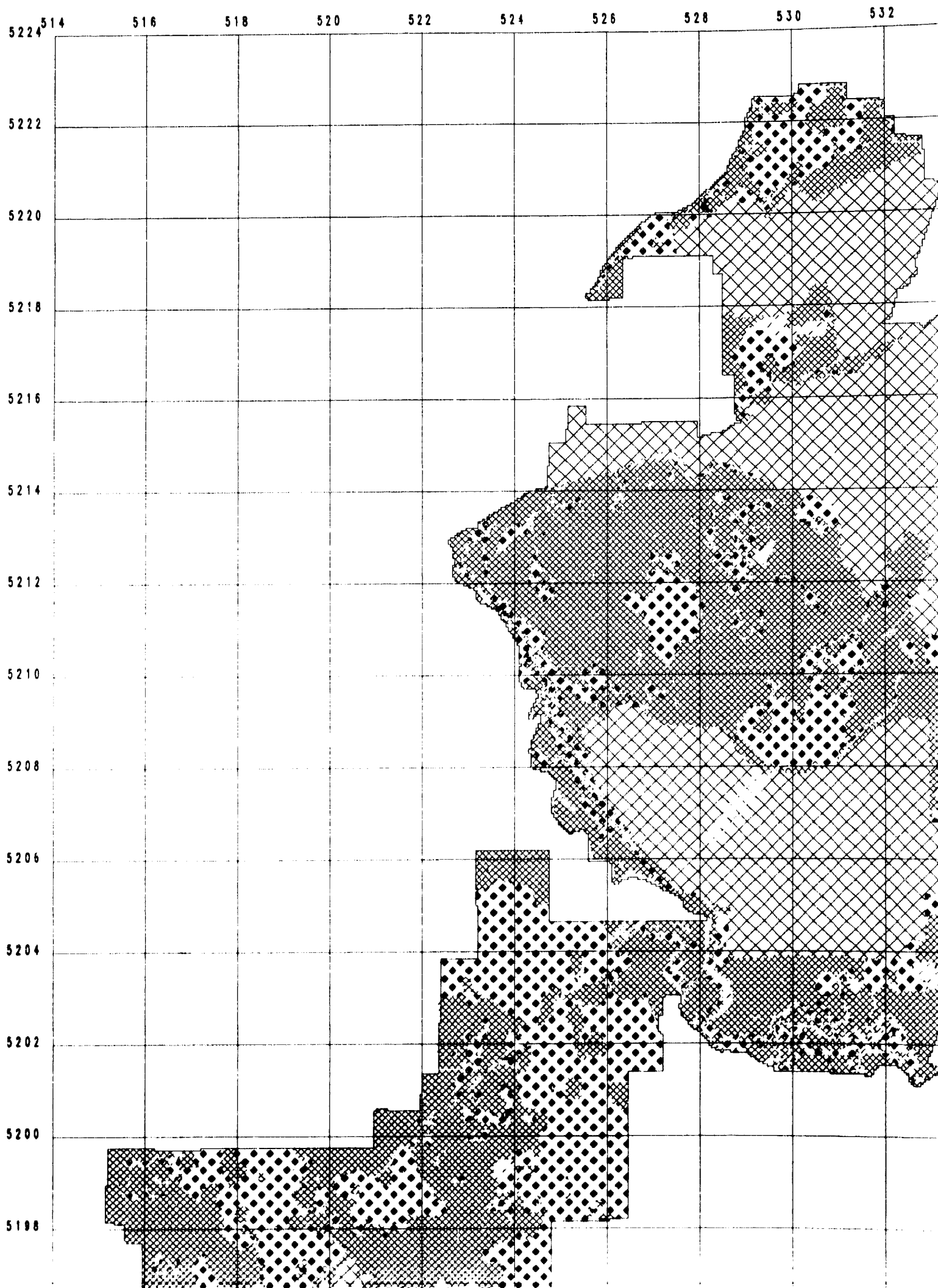
rbance level map for 3-3-5 and 4-3-3 (HMMWV) force structures in the dry normal surface cor



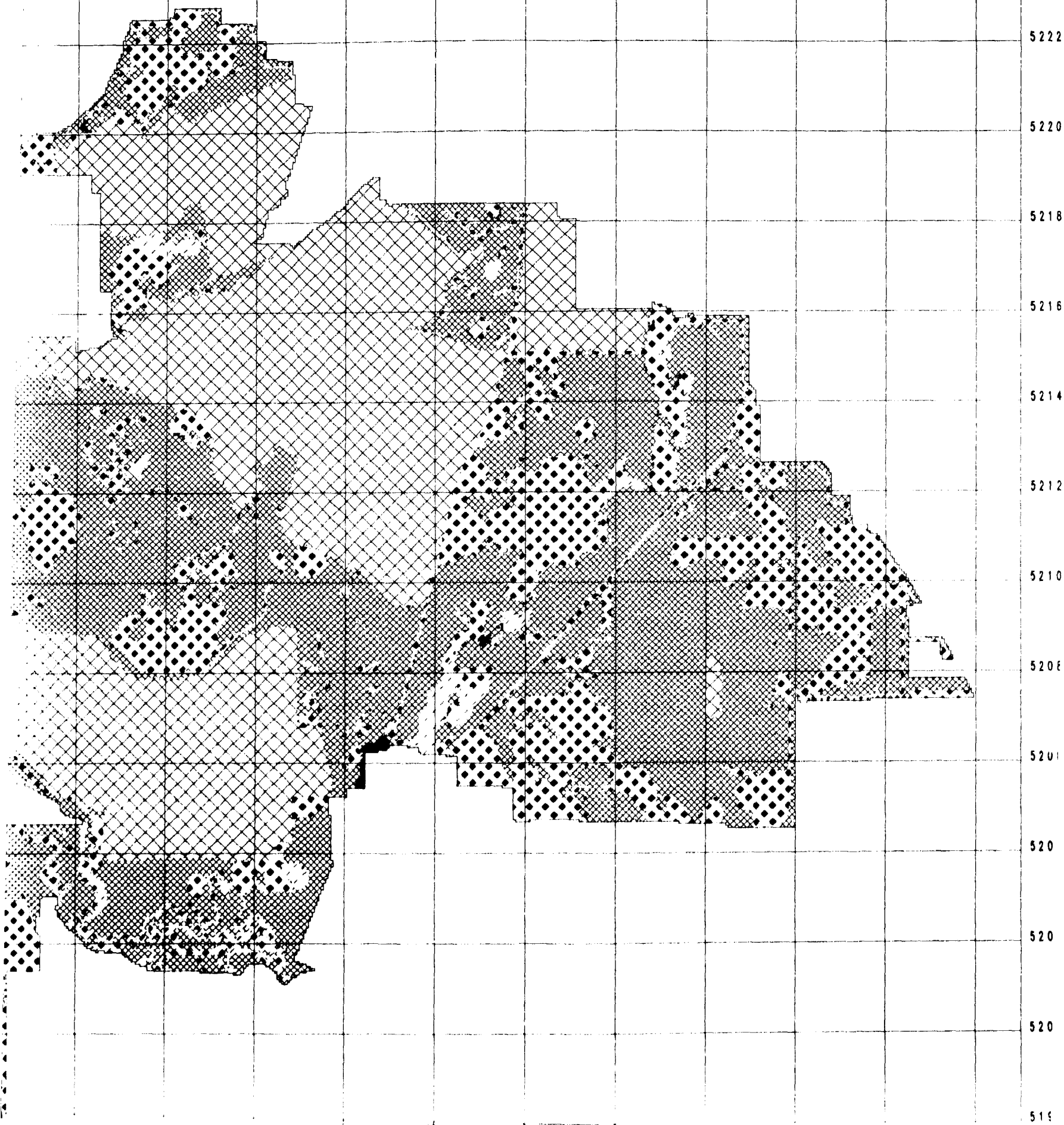
FT LEWIS, WASHINGTON
3-3-5 FORCE STRUCTURE
DRY SEASON
NORMAL CONDITION
50 PASSES



in the dry normal surface condition



528 530 532 534 536 538 540 542 544 546 548 5224



544

546

548

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200

5198



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL DISTURBANCE LEVELS

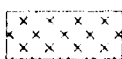
SCALE 1:100000



NOGO



HIGH
(>5-12 in)



MINIMUM
(0-.5 in)



SEVERE
(>12 in)



SLIGHT
(.5-2 in)



URBAN/
OFF LIMITS



MODERATE
(>2-5 in)



WATER

FT LEWIS, WASHINGTON

3-3-5 FORCE STRUCTURE

DRY SEASON

NORMAL CONDITION

1000 PASSES

METERS

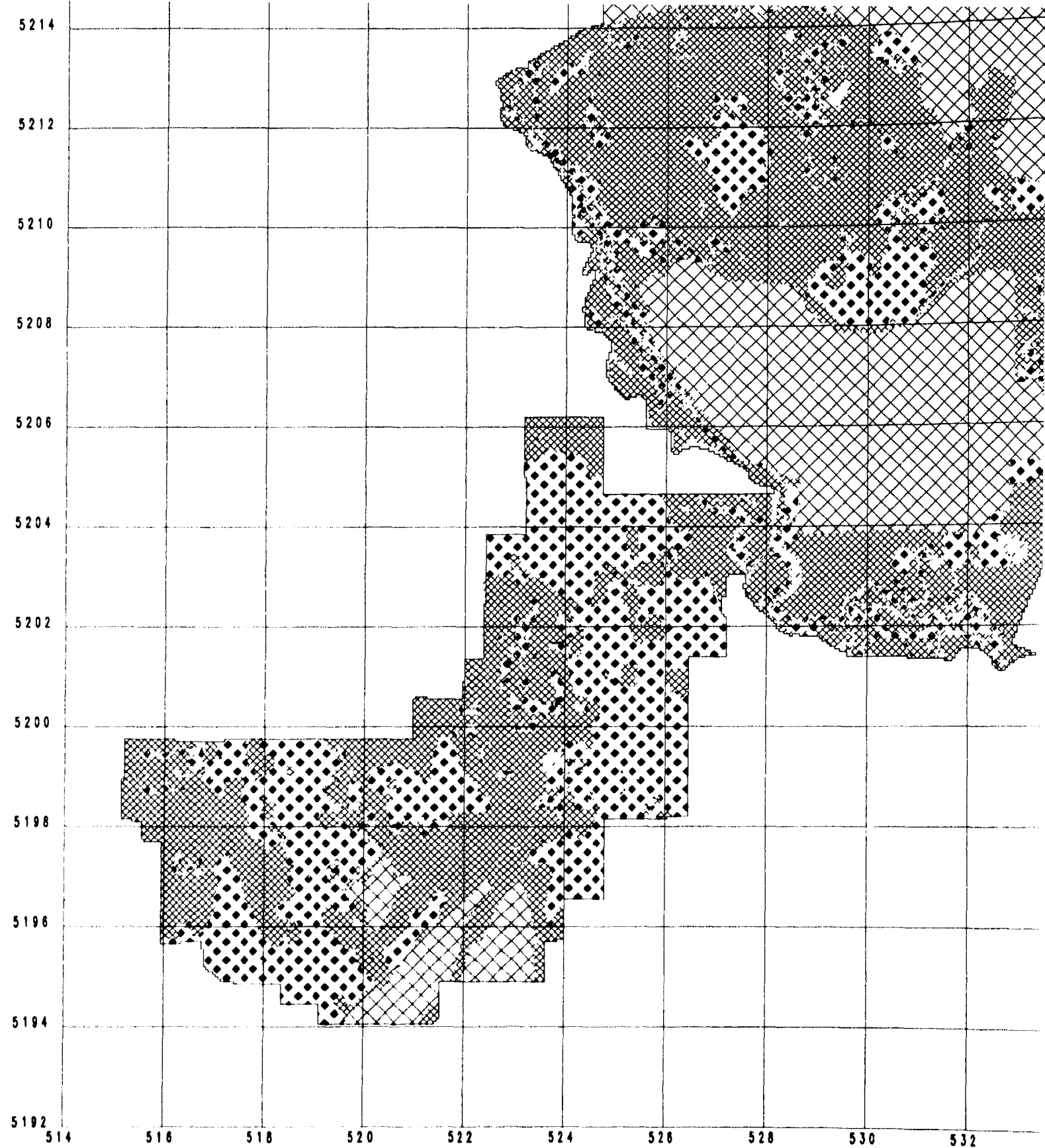
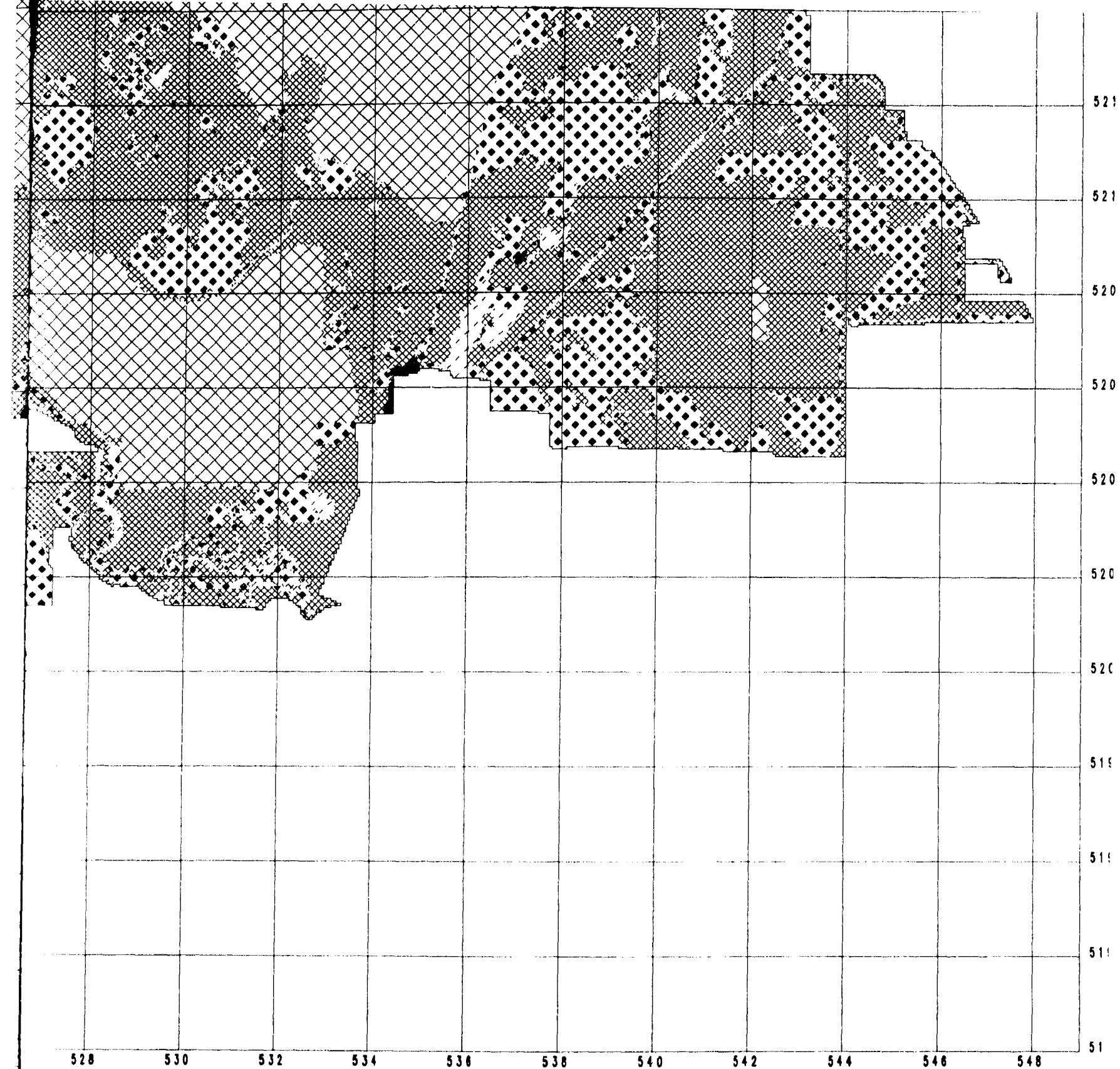
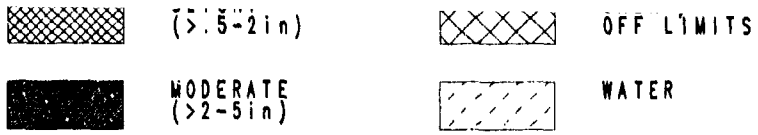
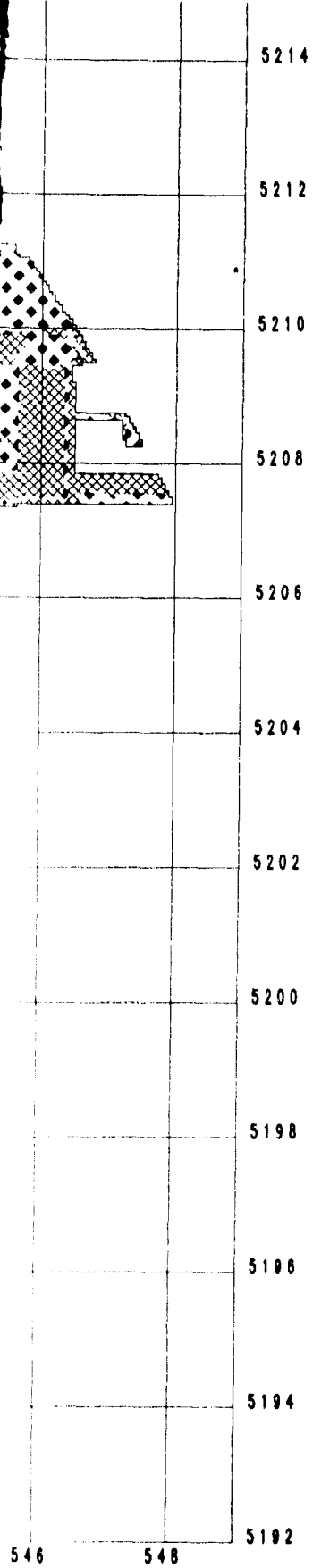


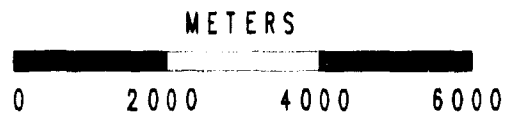
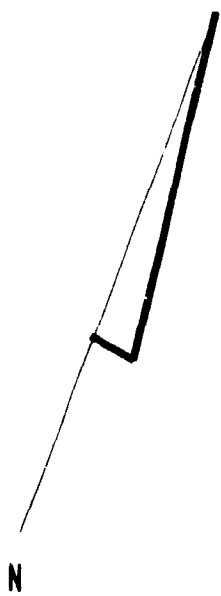
Plate 17. One thousand pass soil disturbance level m



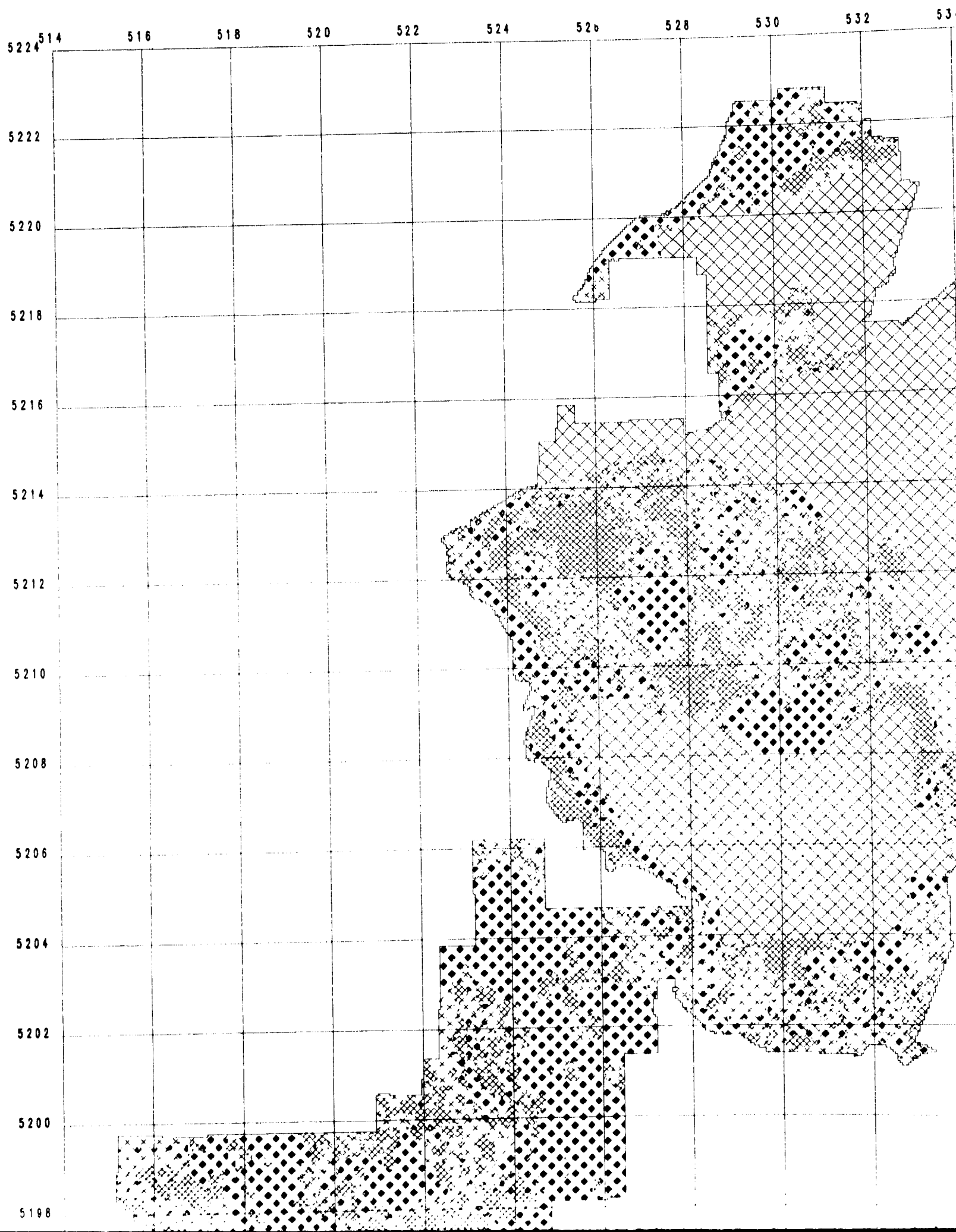
s soil disturbance level map for 3-3-5 and 4-3-3 (HMMWV) force structures in the dry normal



FT LEWIS, WASHINGTON
3-3-5 FORCE STRUCTURE
DRY SEASON
NORMAL CONDITION
1000 PASSES



in the dry normal surface condition



28

530

532

534

536

538

540

542

544

546

548

5224

5222

5220

5218

5216

5214

5212

5210

5208

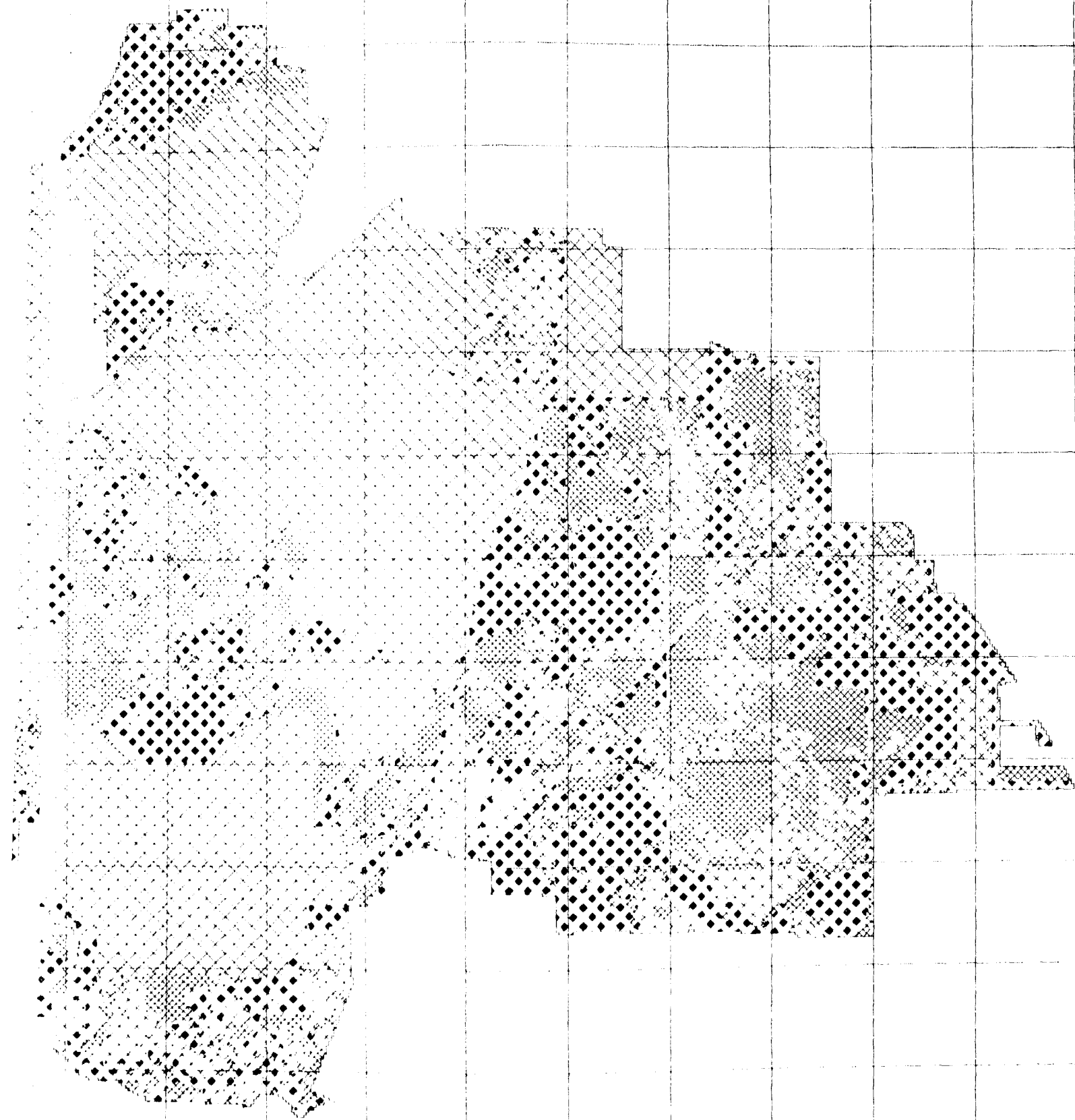
5206

5204

5202

5200

5198





U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL DISTURBANCE LEVELS

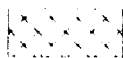
SCALE 1:100000



NOGO



HIGH
(>5-12 in)



MINIMUM
(0-.5 in)



SEVERE
(>12 in)



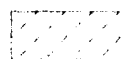
SLIGHT
(.5-2 in)



URBAN/
OFF LIMITS



MODERATE
(>2-5 in)



WATER

FT LEWIS, WASHINGTON

3-3-5 FORCE STRUCTURE

WET SEASON

SLIPPERY CONDITION

10 PASSES

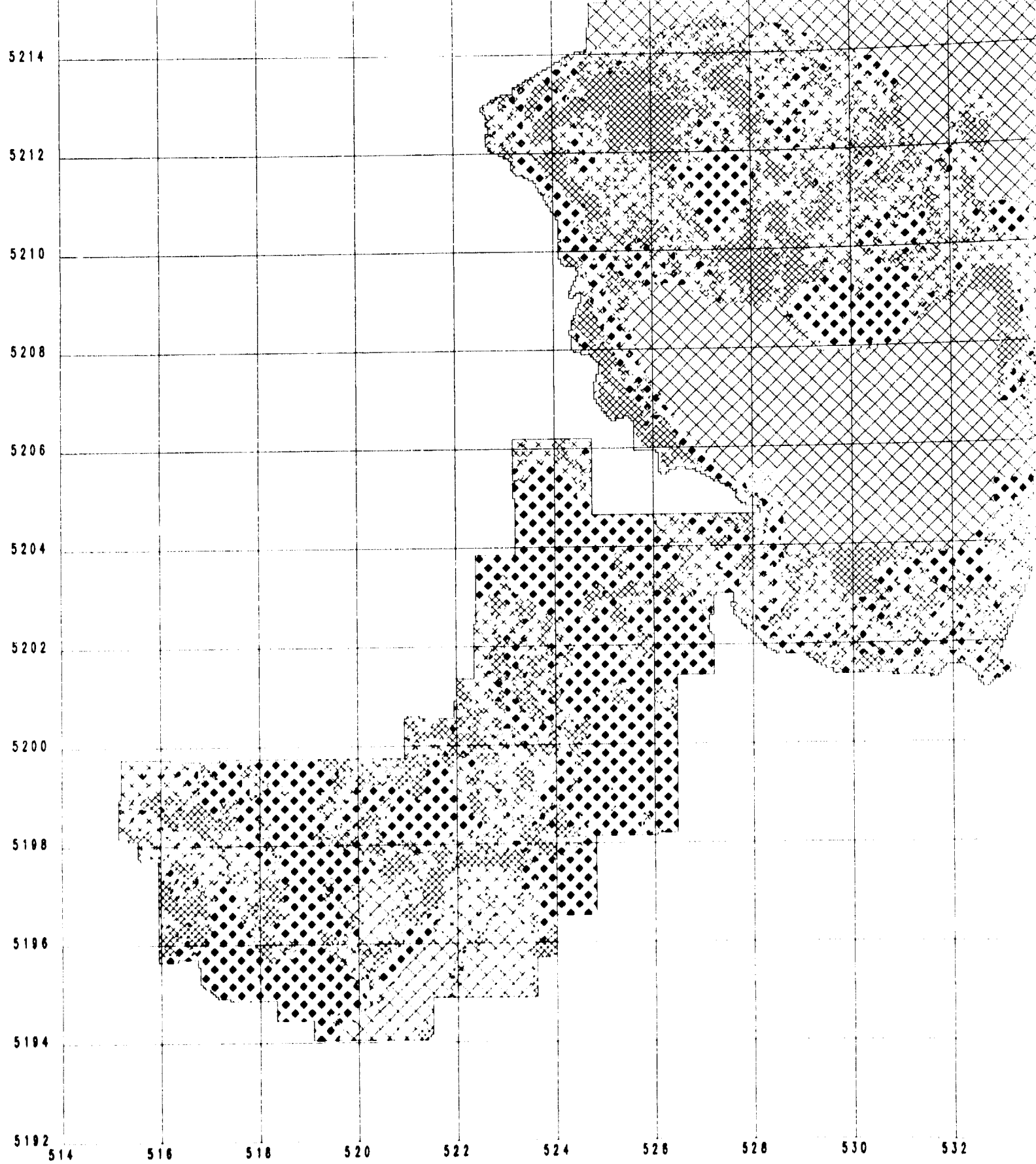
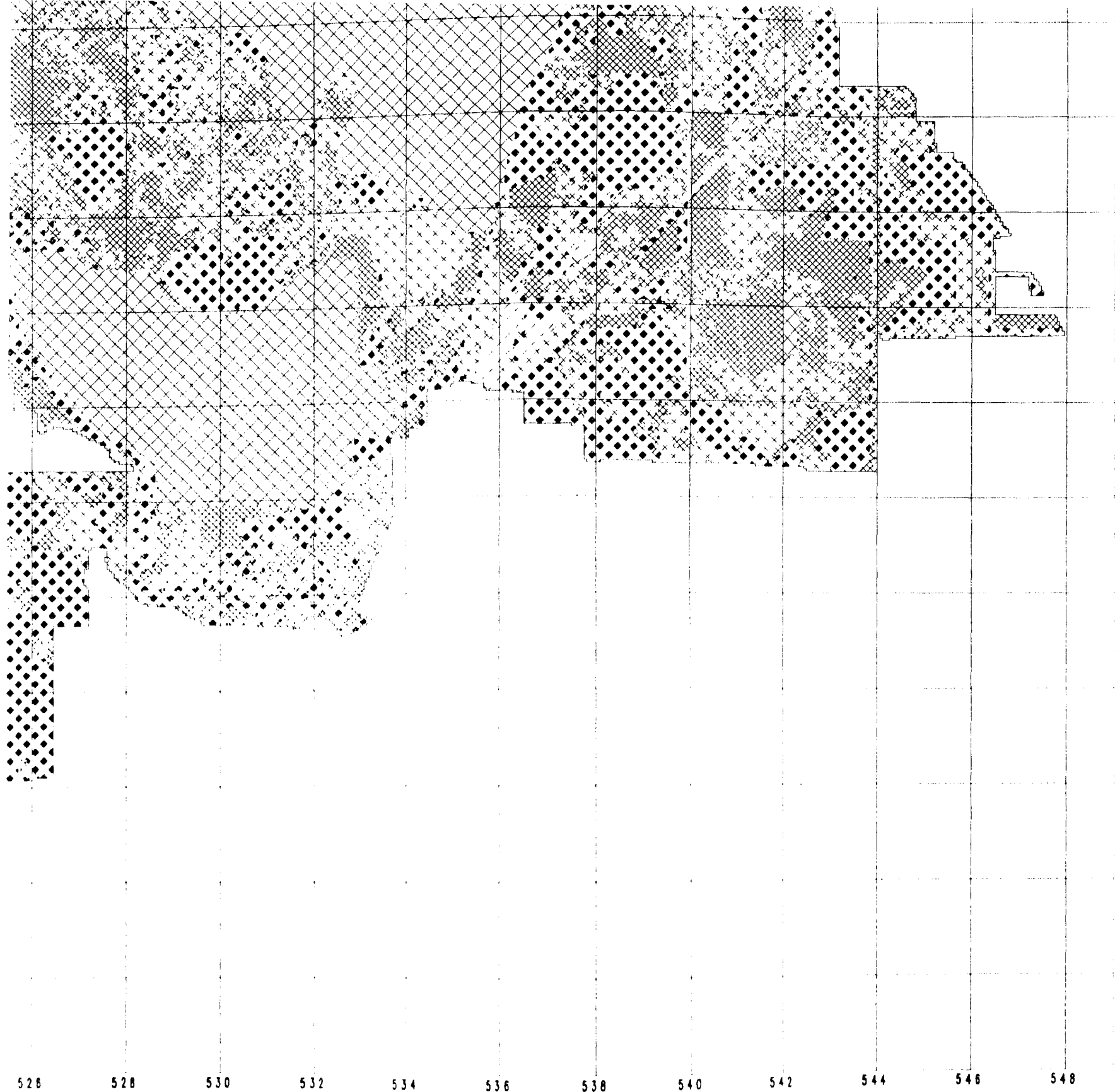
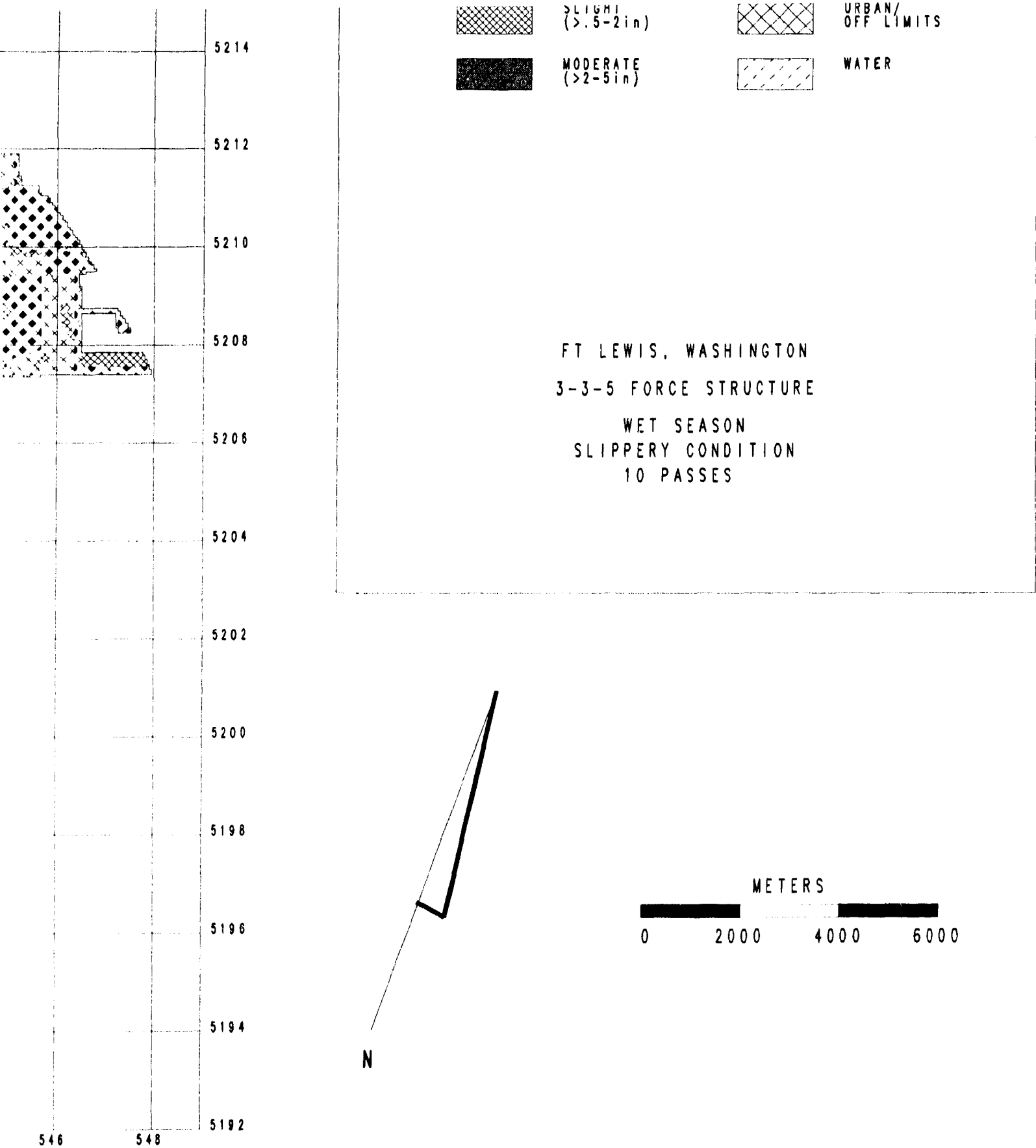


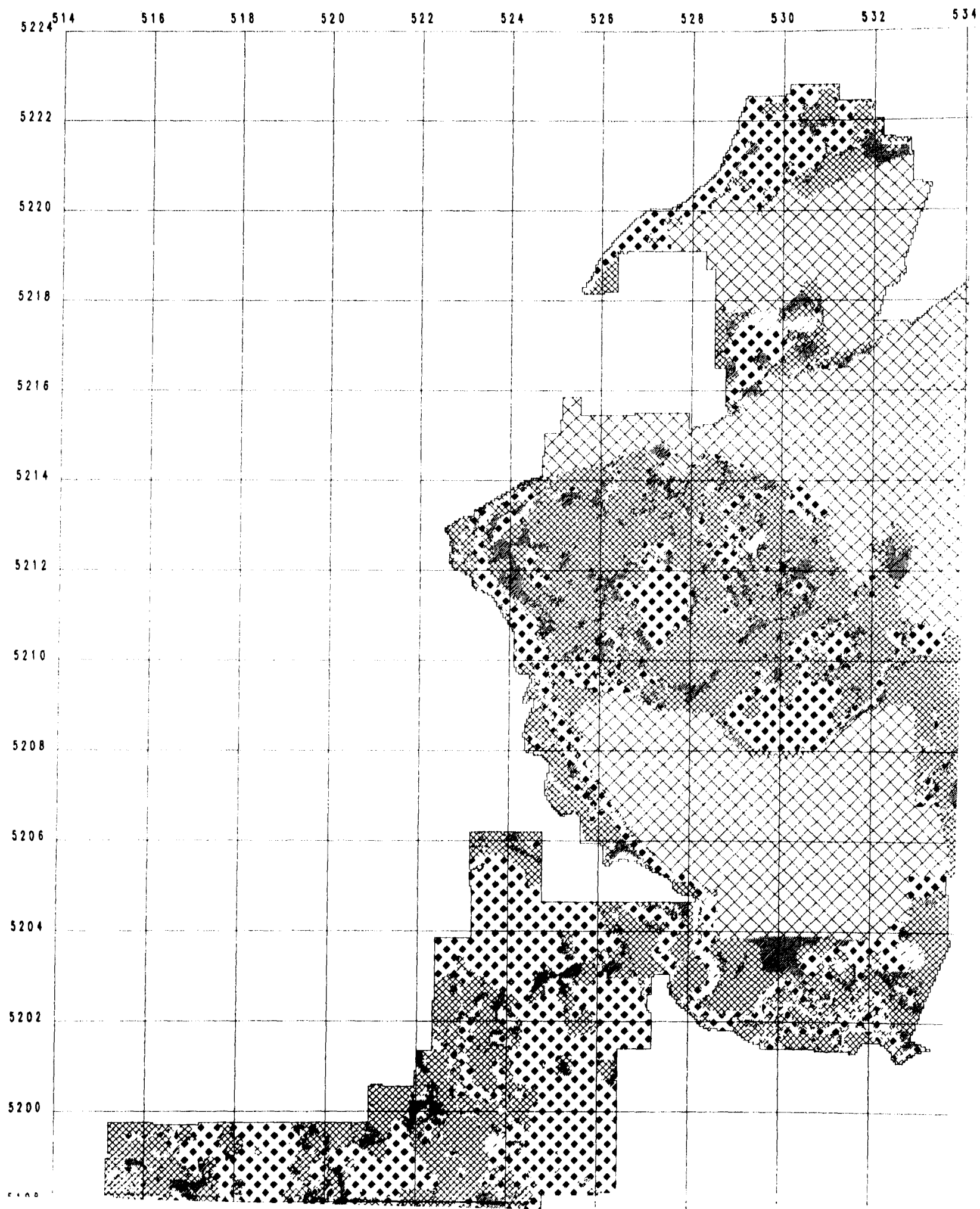
Plate 18. Ten pass soil disturbance le



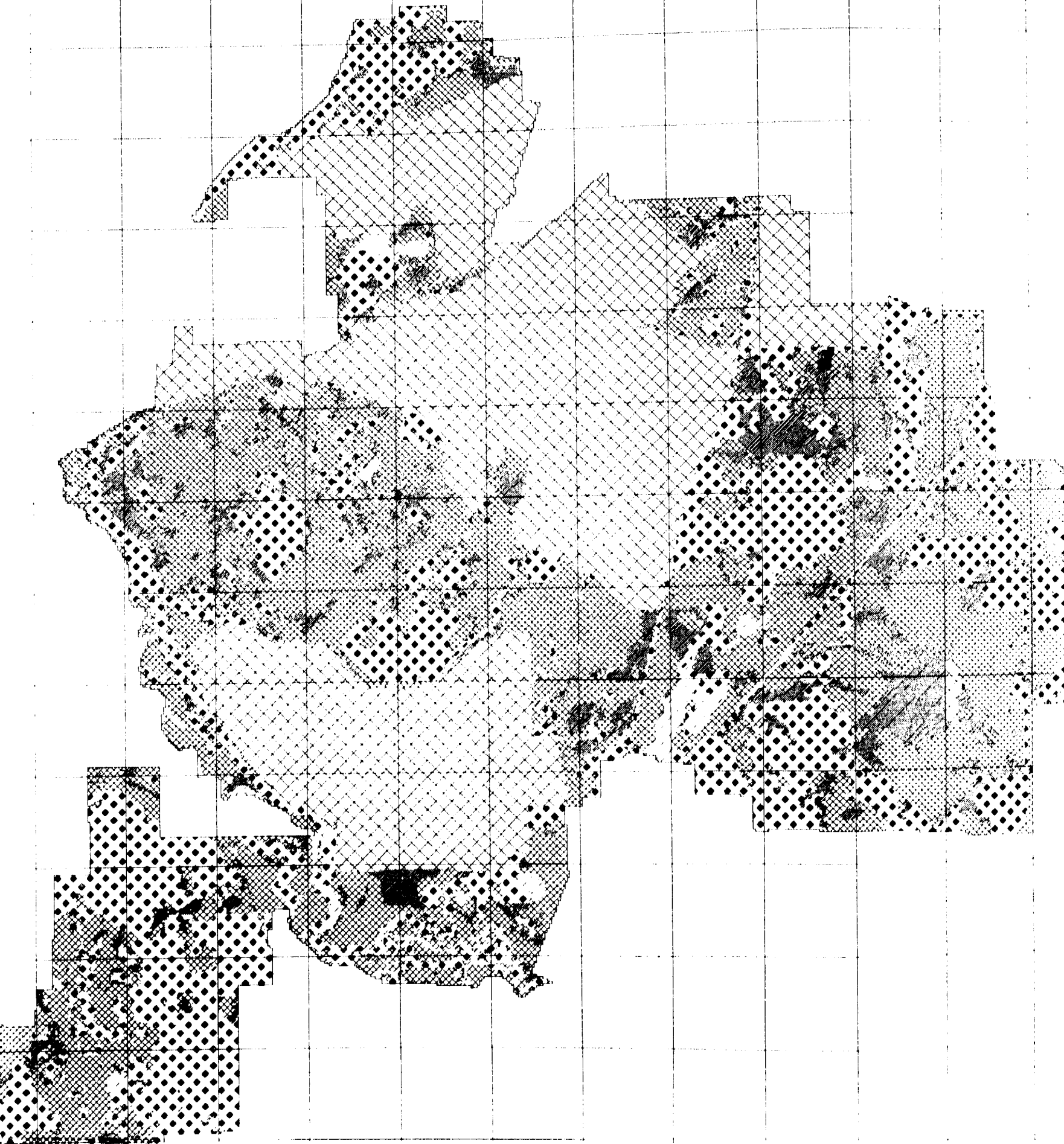
18. Ten pass soil disturbance level map for 3-3-5 and 4-3-3 (HMMWV) force structures in the w



ictures in the wet slippery surface condition



522 524 526 528 530 532 534 536 538 540 542 544



546

548

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200

5198



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL DISTURBANCE LEVELS

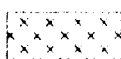
SCALE 1:100000



NOGO



HIGH
(>5-12 in)



MINIMUM
(0-.5 in)



SEVERE
(>12 in)



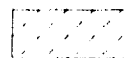
SLIGHT
(.5-2 in)



URBAN/
OFF LIMITS



MODERATE
(>2-5 in)



WATER

FT LEWIS, WASHINGTON

3-3-5 FORCE STRUCTURE

WET SEASON

SLIPPERY CONDITION

50 PASSES

METERS

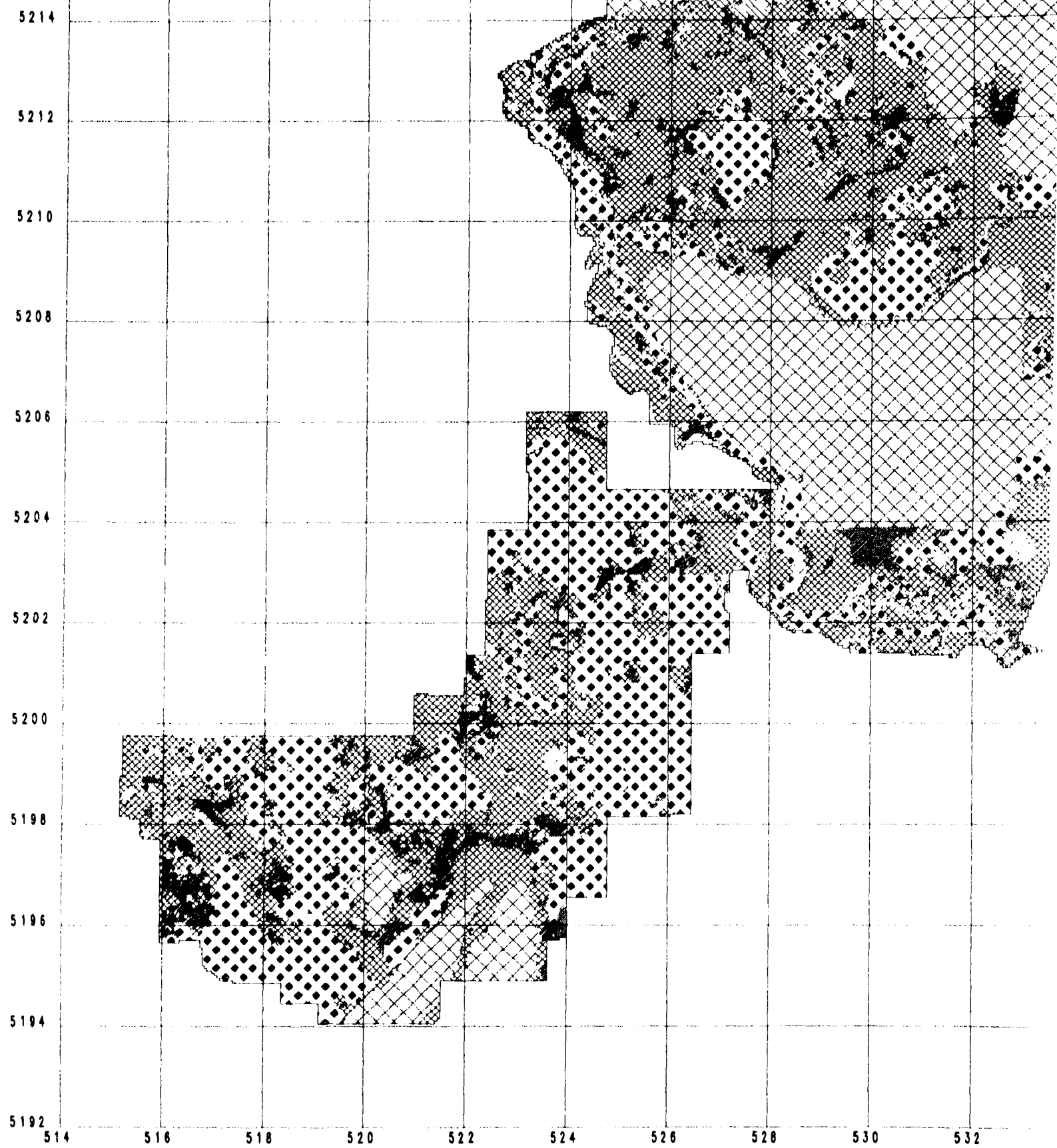


Plate 19. Fifty pass soil disturbance 1

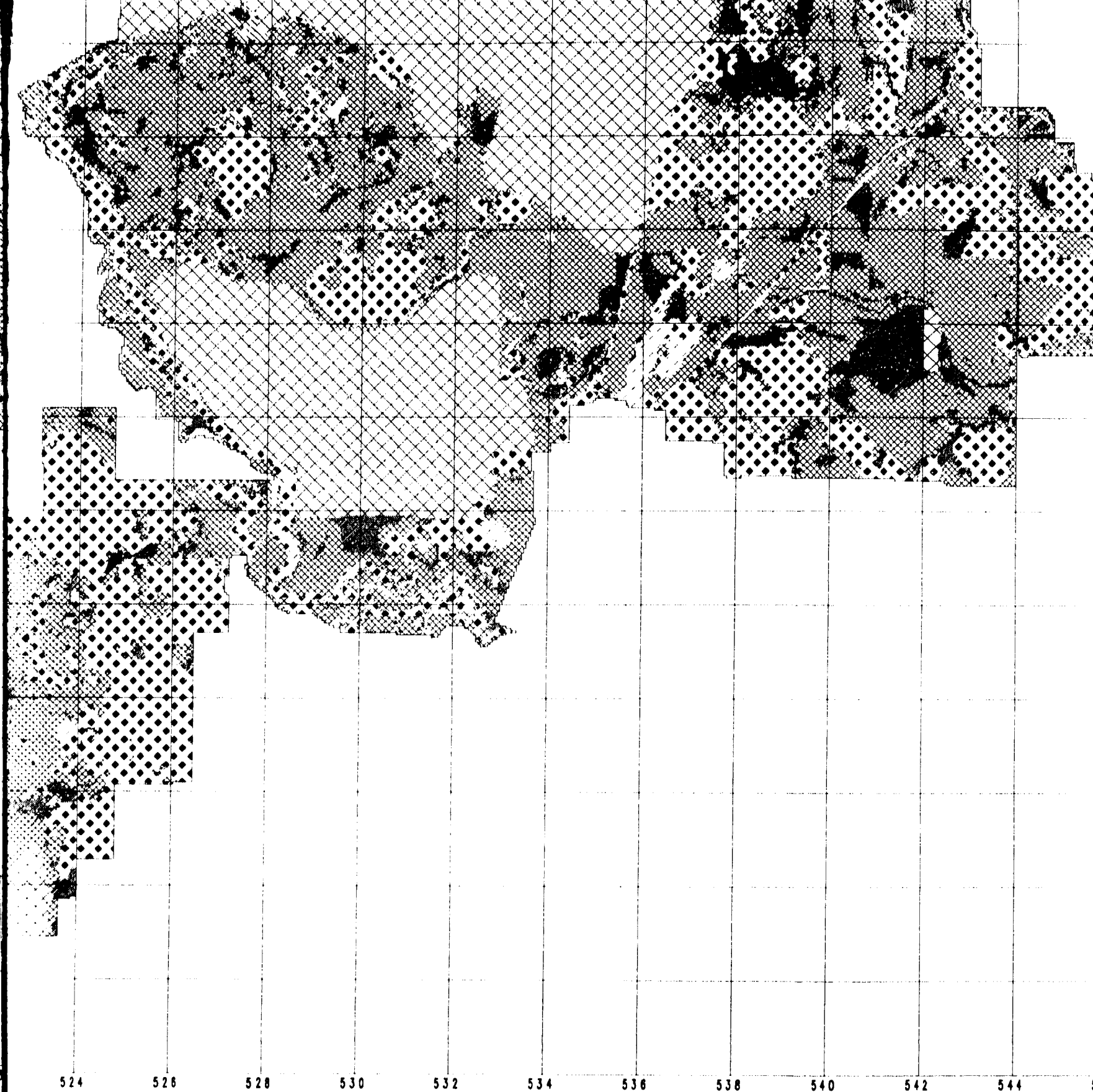
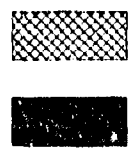
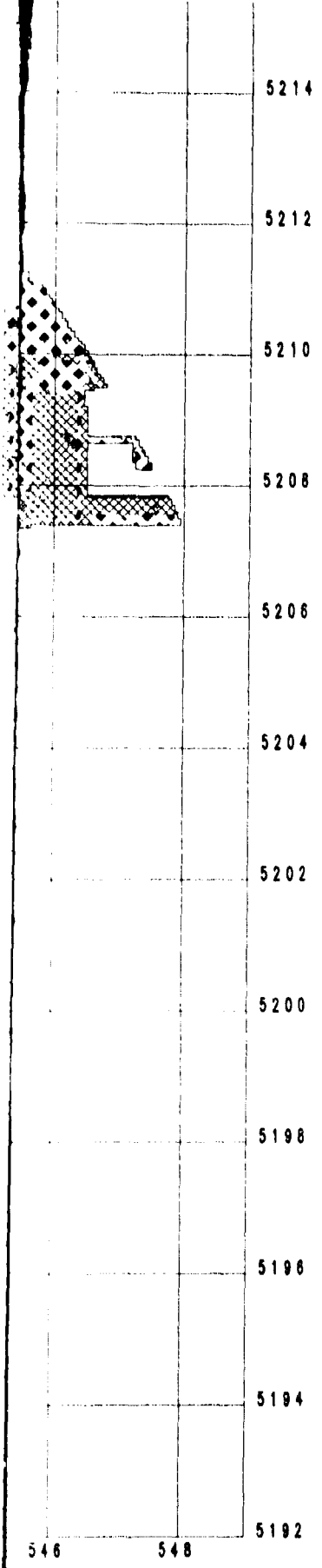
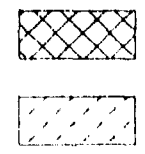


Plate 19. Fifty pass soil disturbance level map for 3-3-5 and 4-3-3 (HMMWV) force struc



SLIGHT
(>.5-2in)

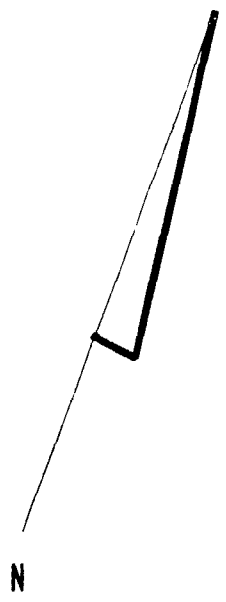
MODERATE
(>2-5in)



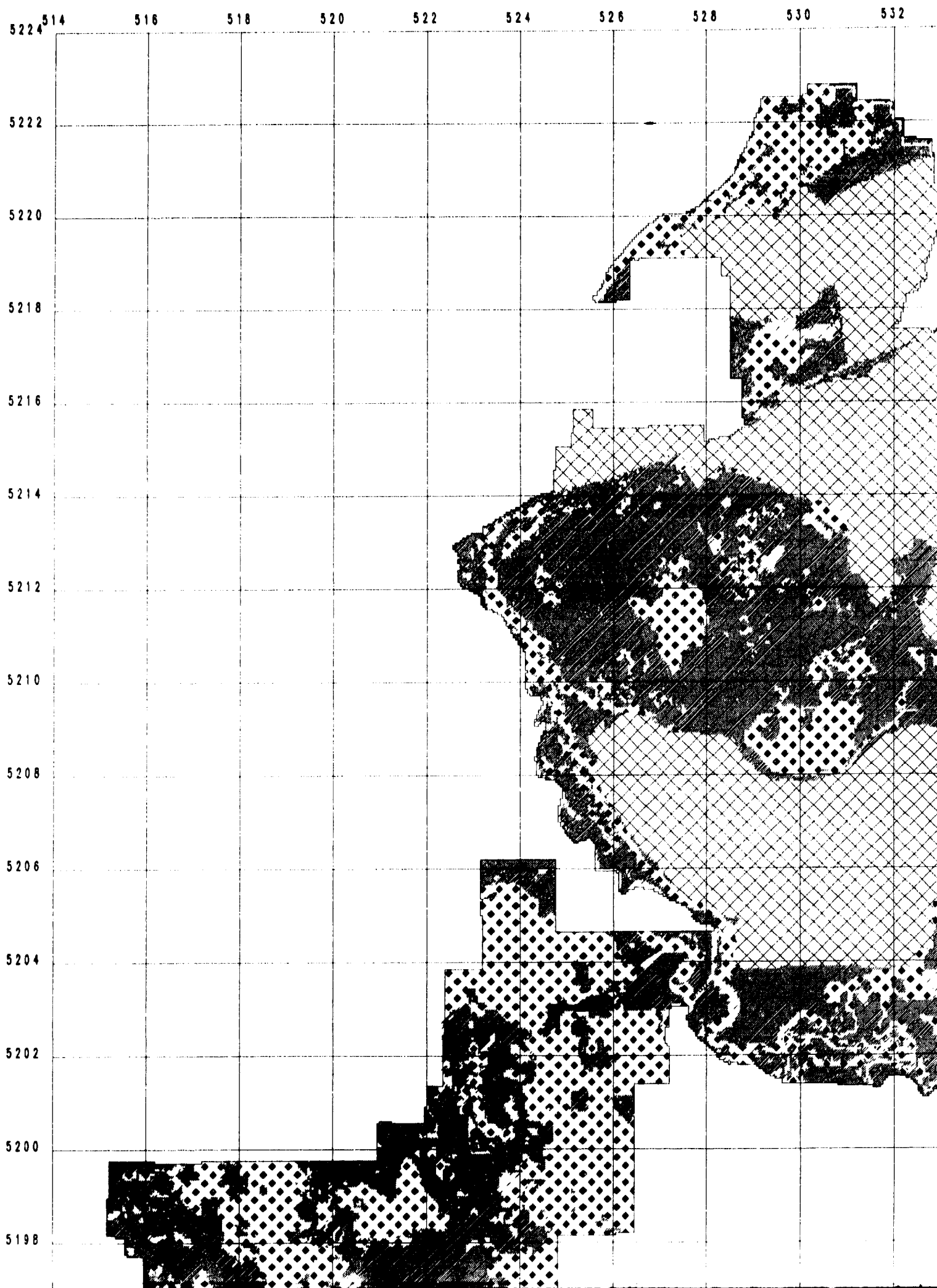
URBAN/
OFF LIMITS

WATER

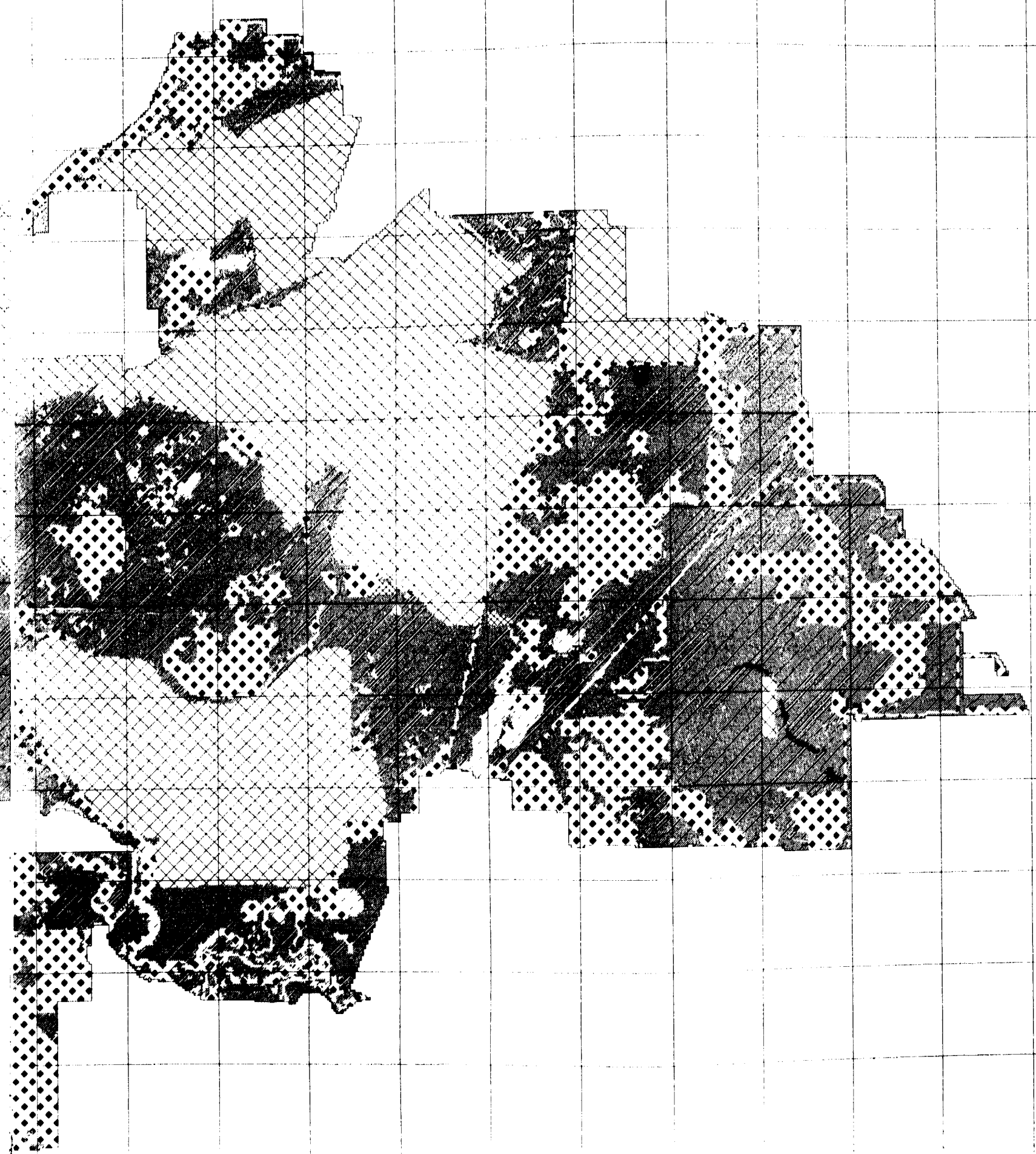
FT LEWIS, WASHINGTON
3-3-5 FORCE STRUCTURE
WET SEASON
SLIPPERY CONDITION
50 PASSES

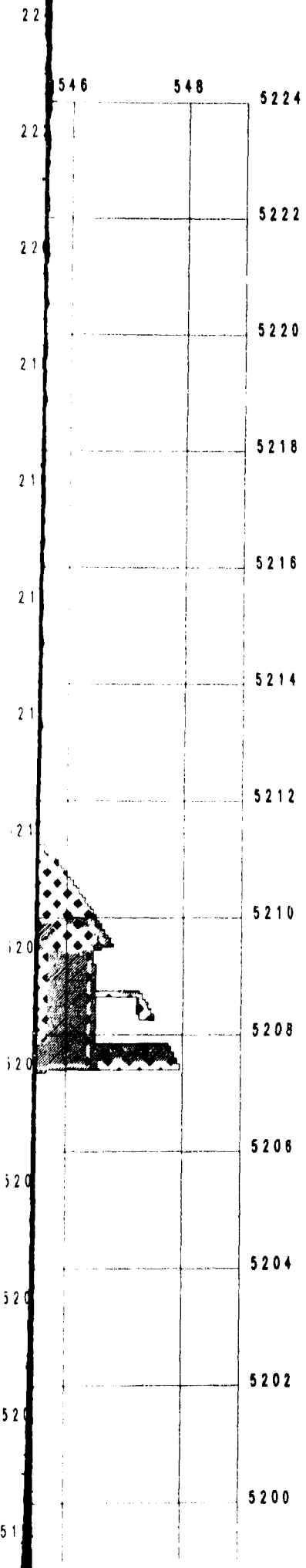


ictures in the wet slippery surface condition



526 528 530 532 534 536 538 540 542 544 546 548





U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL DISTURBANCE LEVELS

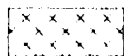
SCALE 1:100000



NOGO



HIGH
(>5-12 in)



MINIMUM
(0-.5 in)



SEVERE
(>12 in)



SLIGHT
(>.5-2 in)



URBAN/
OFF LIMITS



MODERATE
(>2-5 in)



WATER

FT LEWIS, WASHINGTON

3-3-5 FORCE STRUCTURE

WET SEASON

SLIPPERY CONDITION

1000 PASSES

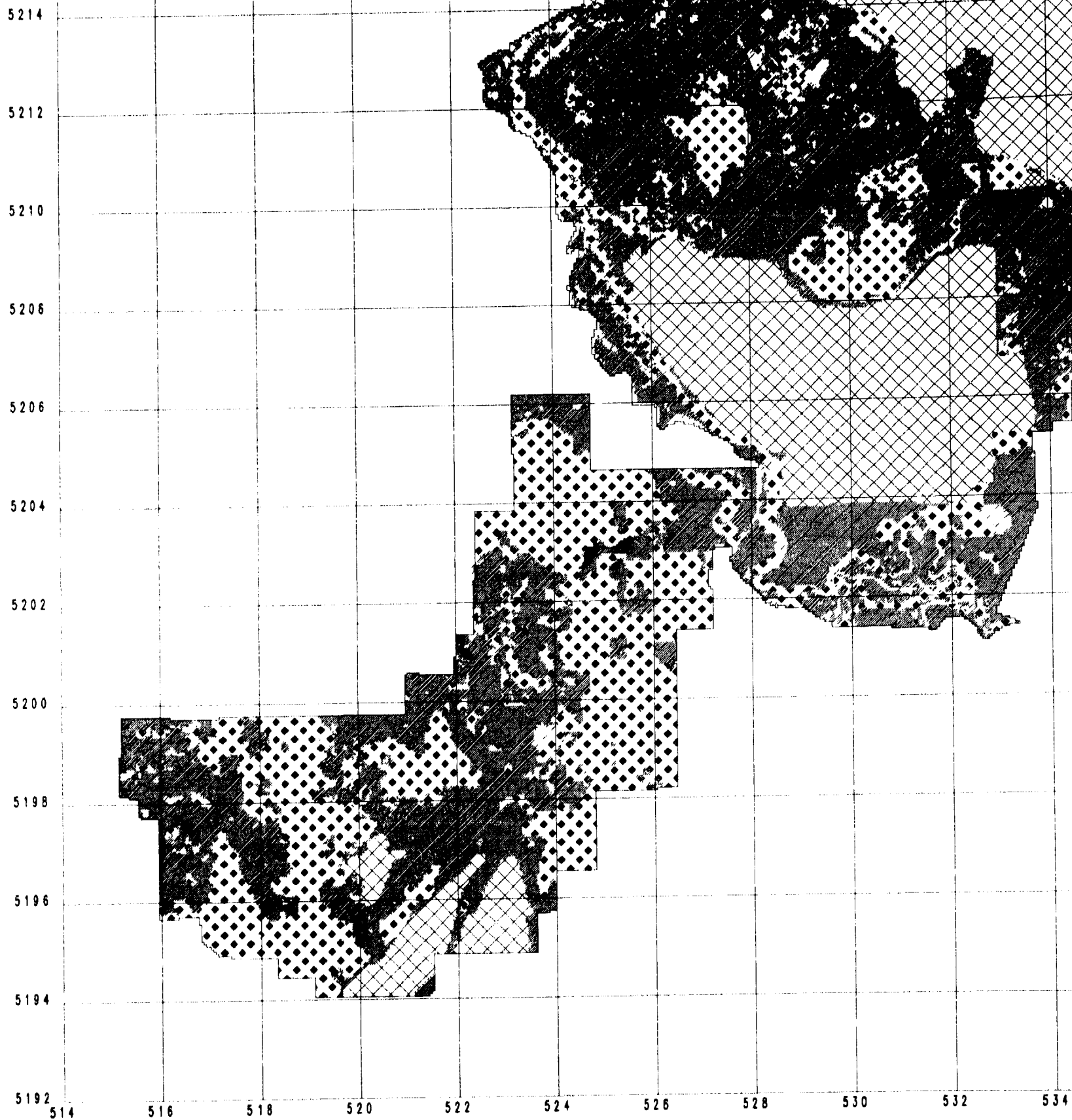
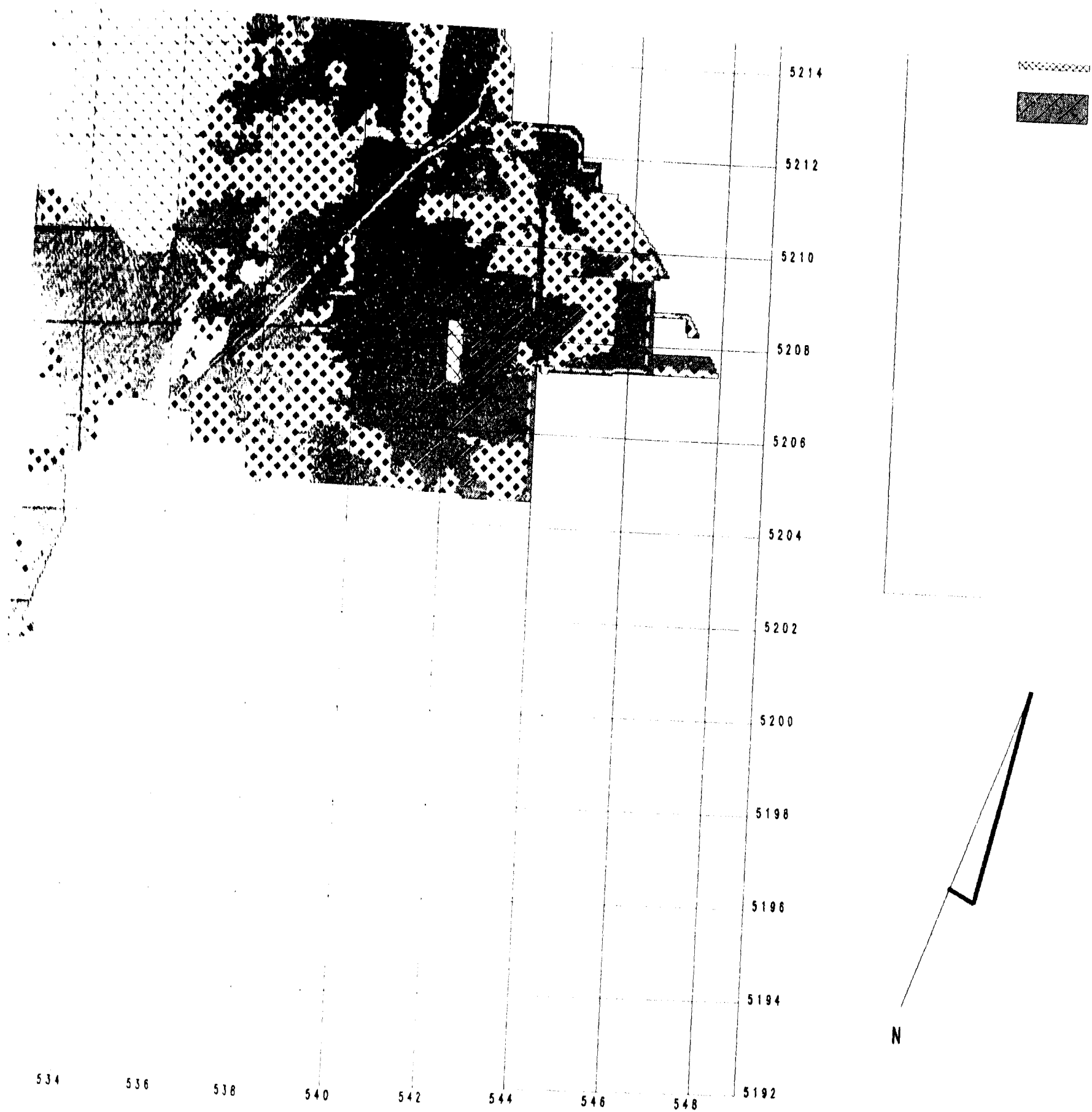
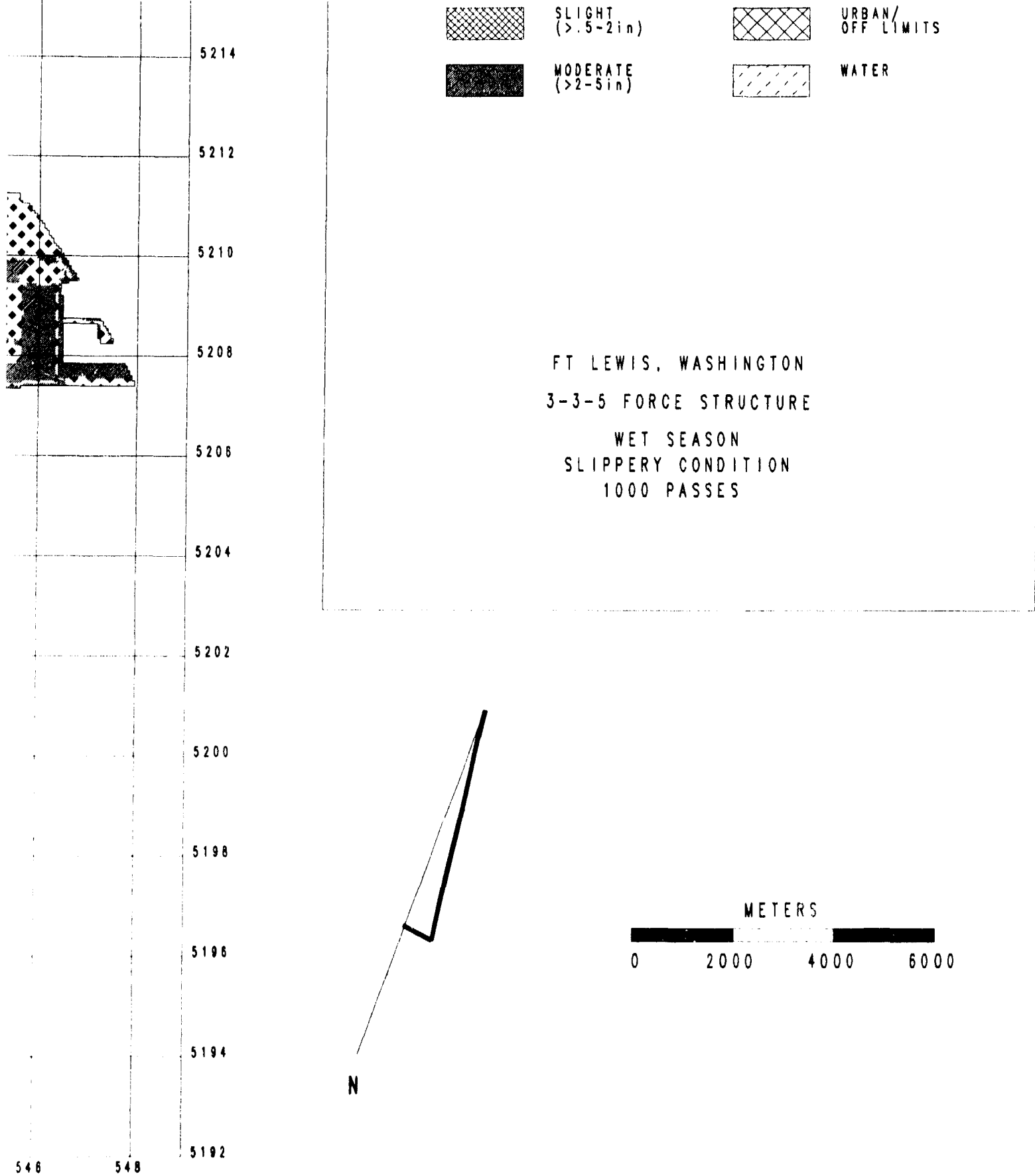


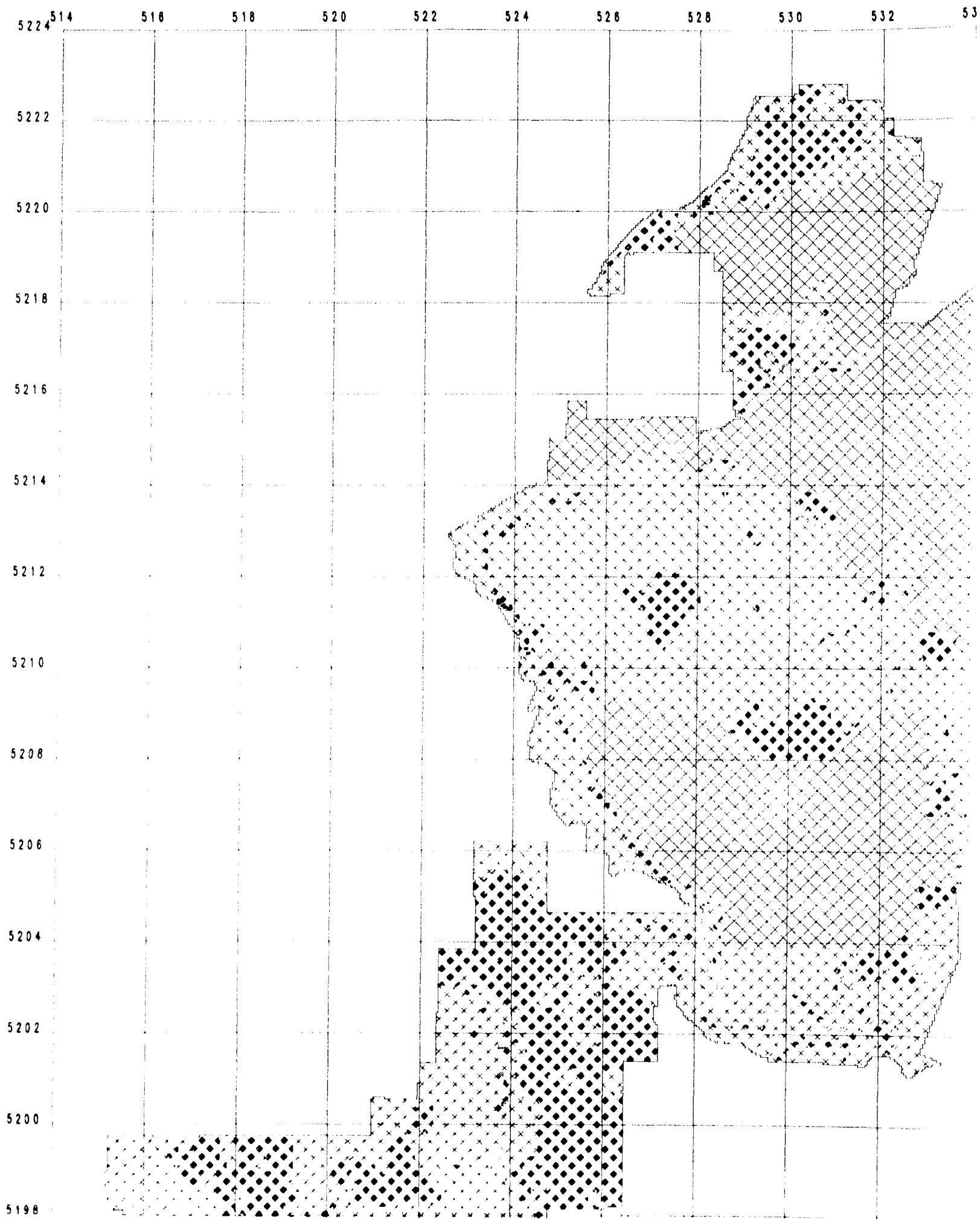
Plate 20. One thousand pass soil disturbance 1

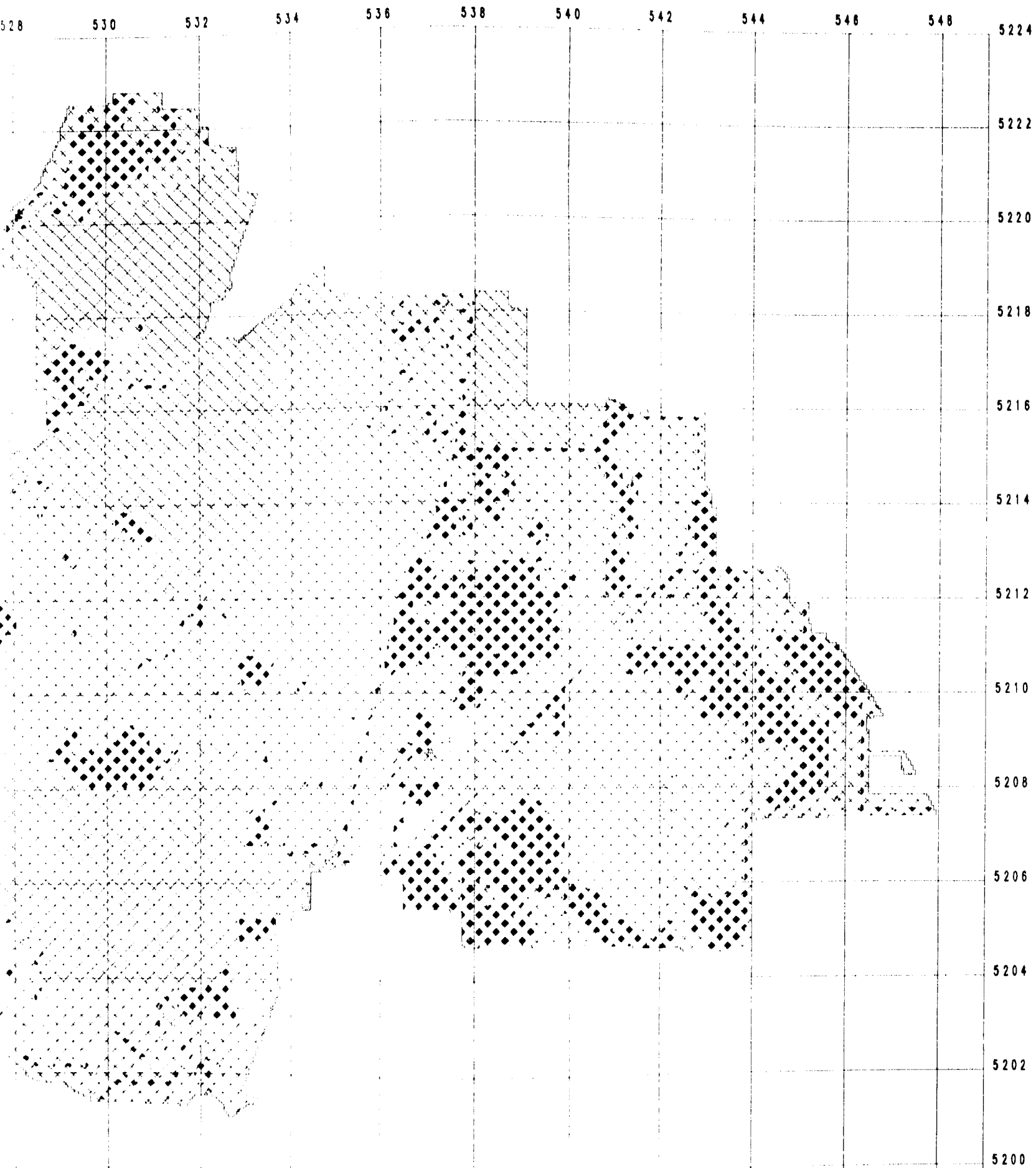


rhance level map for 3-3-5 and 4-3-3 (HMMWV) force structures in the wet slippery surface co



structures in the wet slippery surface condition





546

548

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL DISTURBANCE LEVELS

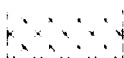
SCALE 1:100000



NOGO



HIGH
(>5-12 in)



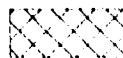
MINIMUM
(0-.5 in)



SEVERE
(>12 in)



SLIGHT
(>.5-2 in)



URBAN/
OFF LIMITS



MODERATE
(>2-5 in)



WATER

FT LEWIS, WASHINGTON

4-3-3 FORCE STRUCTURE

DRY SEASON

NORMAL CONDITION

10 PASSES

5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

5194

5192

514

516

518

520

522

524

526

528

530

532

534

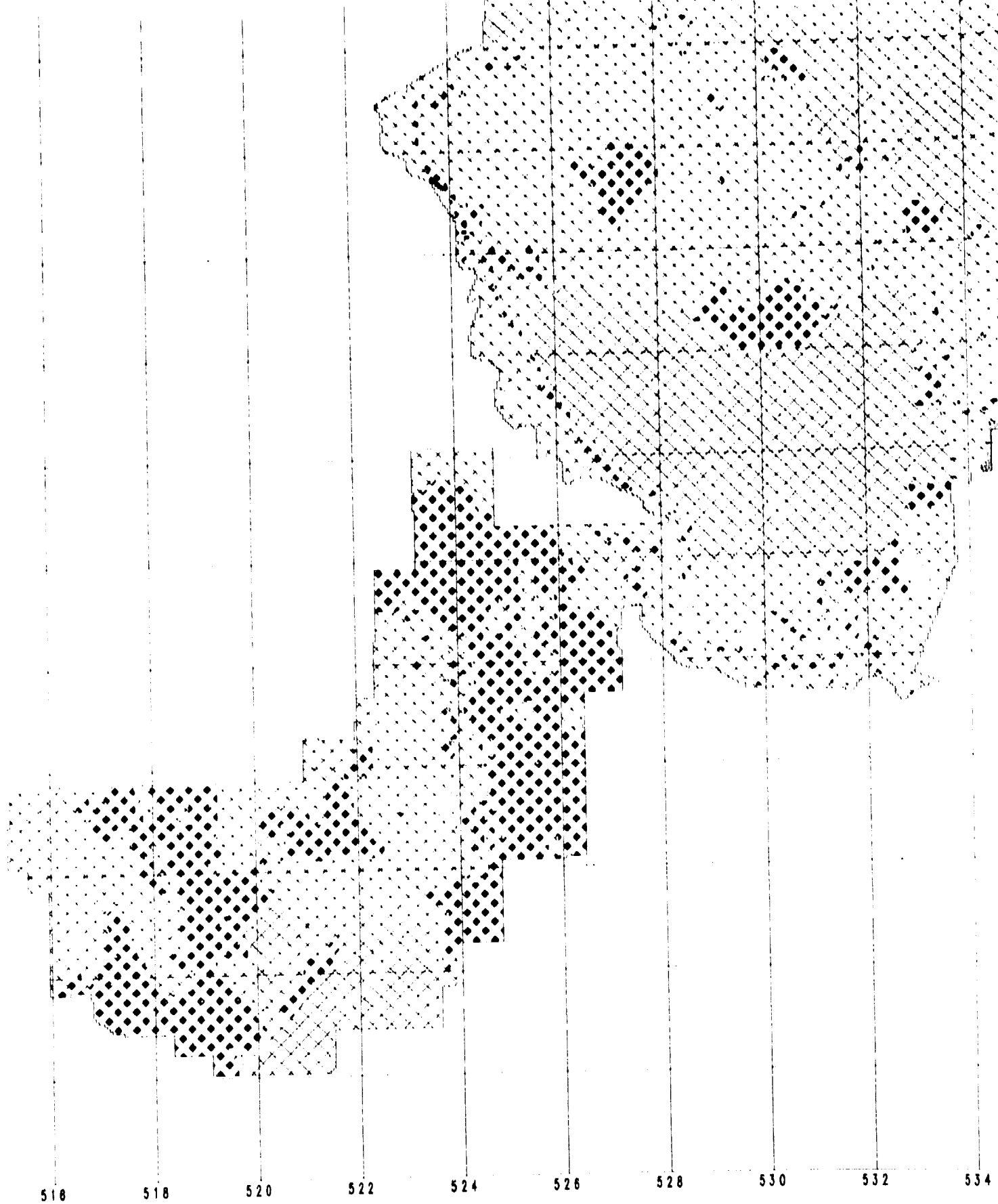
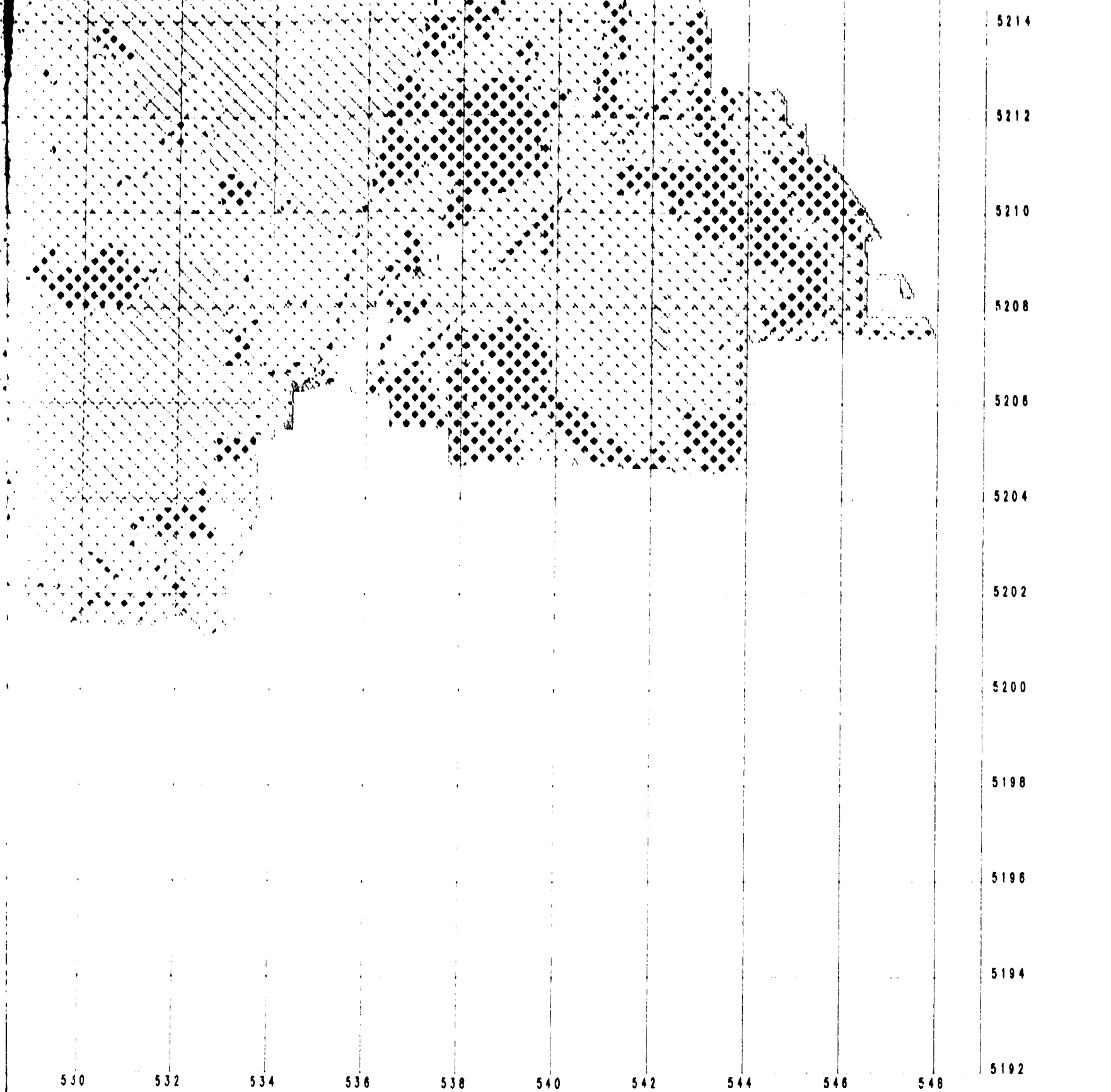
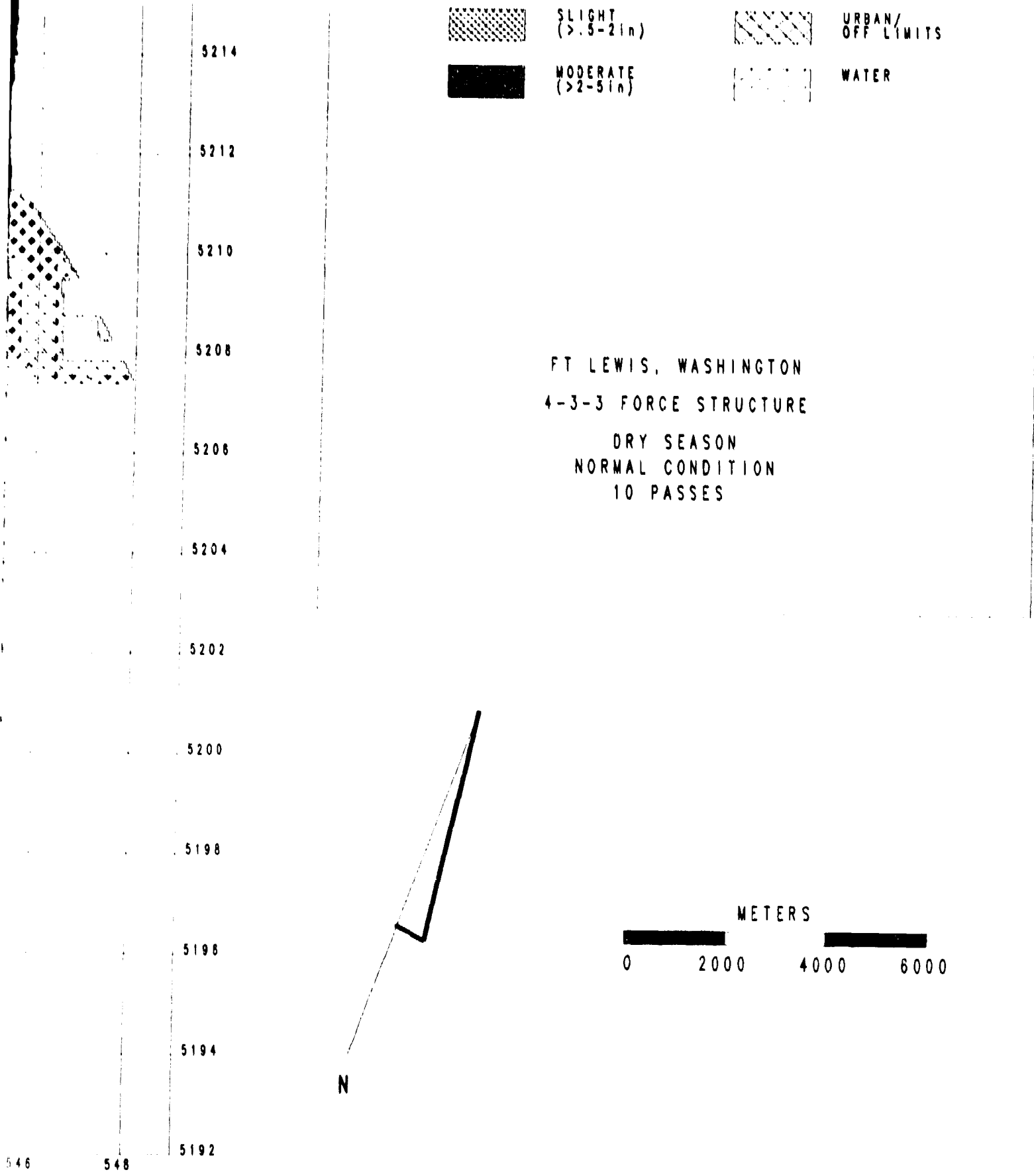


Plate 21. Ten pass soil disturbance level map



il disturbance level map for the 4-3-3 (8X8) force structure in the dry normal surface con



dry normal surface condition

5224⁵¹⁴

516

518

520

522

524

526

528

530

532

534

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200



528

528

530

532

534

536

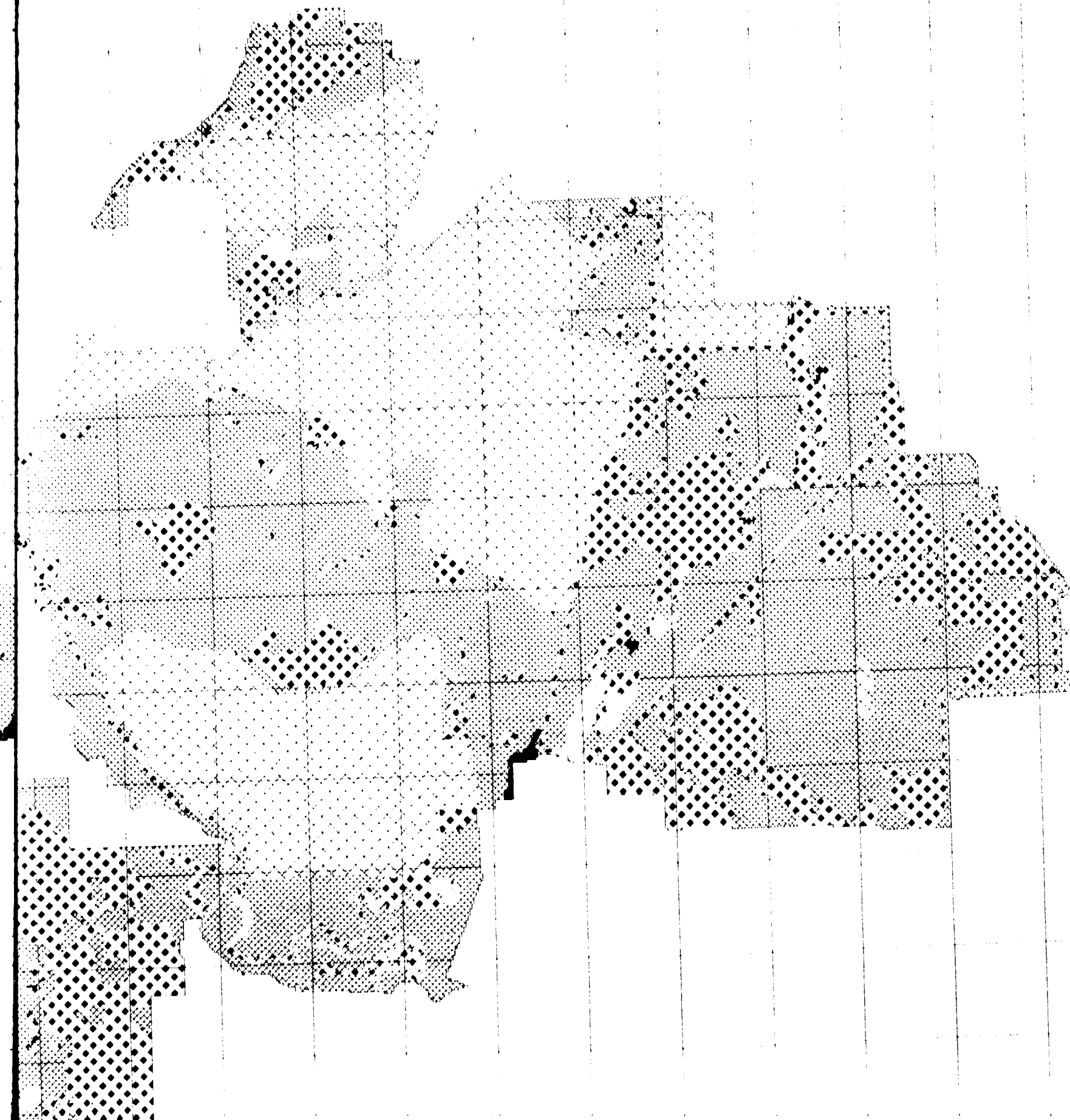
538

540

542

544

546



46 546 548 5224



U. S. Army Corps of Engineers
Waterways
Experiment
Station

5220

SOIL DISTURBANCE LEVELS

5218

SCALE 1:100000



NO SOIL



HEAVY
(15-12 in)

5216



MODERATE
(10-15 in)

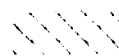


SEVERE
(12-15 in)

5214



SLIGHT
(5-10 in)



URBAN
OFF LIMITS

5212



WATER
(12-15 in)

WATER

5210

5208

AT LEWIS, WASHINGTON

4 3 3 FORCE STRUCTURE

5206

DRY SEASON
NORMAL CONDITION
50 PASSES

5204

5202

5200

5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

5194

5192

514

516

518

520

522

524

526

528

530

532

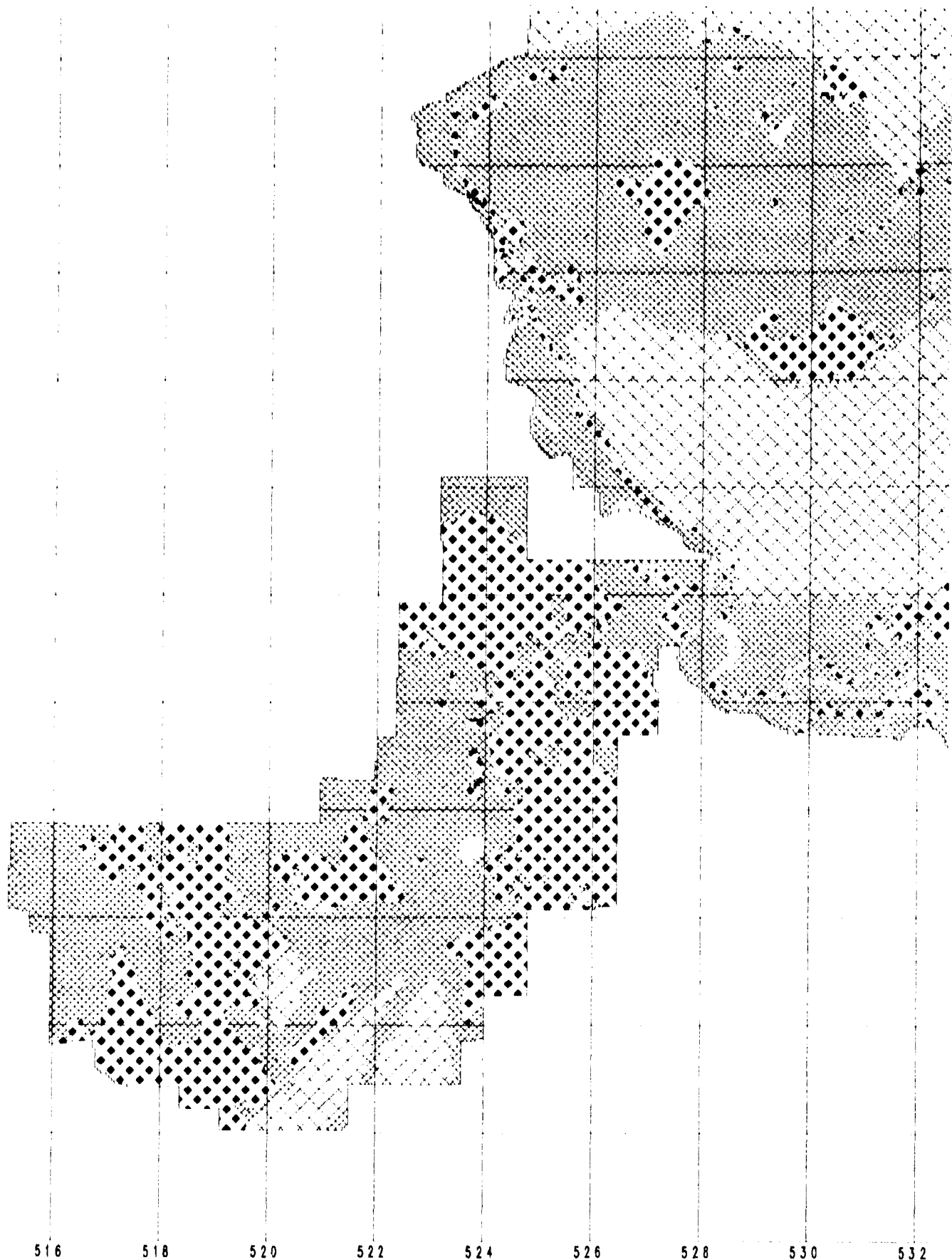
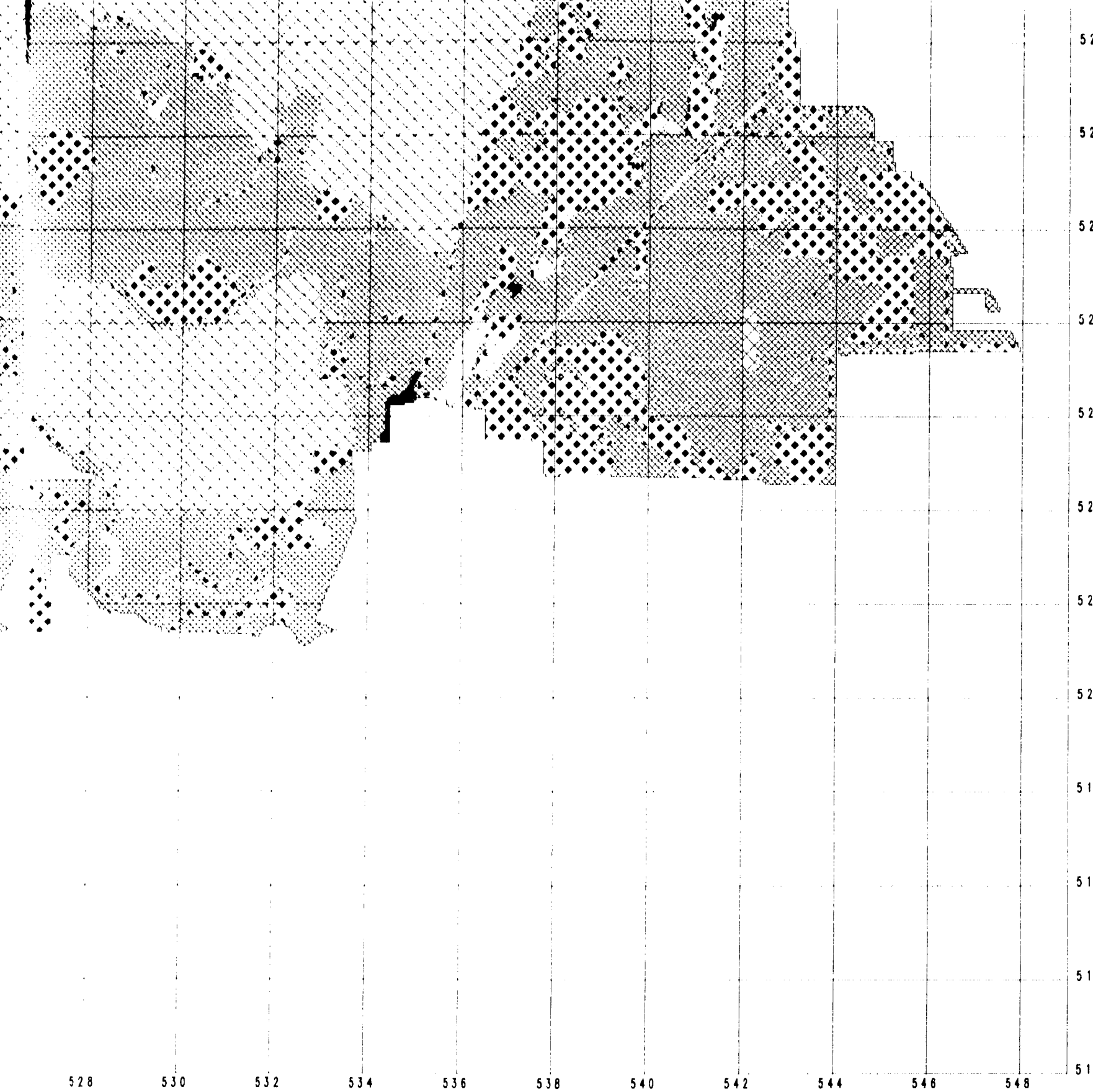
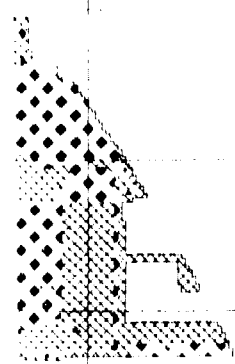


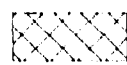
Plate 22. Fifty pass soil disturbar



ifty pass soil disturbance level map for the 4-3-3 (8X8) force structure in the dry normal



SLIGHT
(>.5-2 in)



URBAN/
OFF LIMITS



MODERATE
(>2-5 in)



WATER

5214

5212

5210

5208

5206

5204

FT LEWIS, WASHINGTON
4-3-3 FORCE STRUCTURE
DRY SEASON
NORMAL CONDITION
50 PASSES

5202

5200

5198

5196

5194

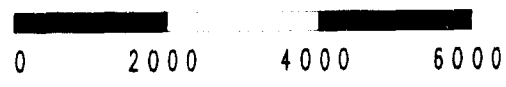
5192

546

548

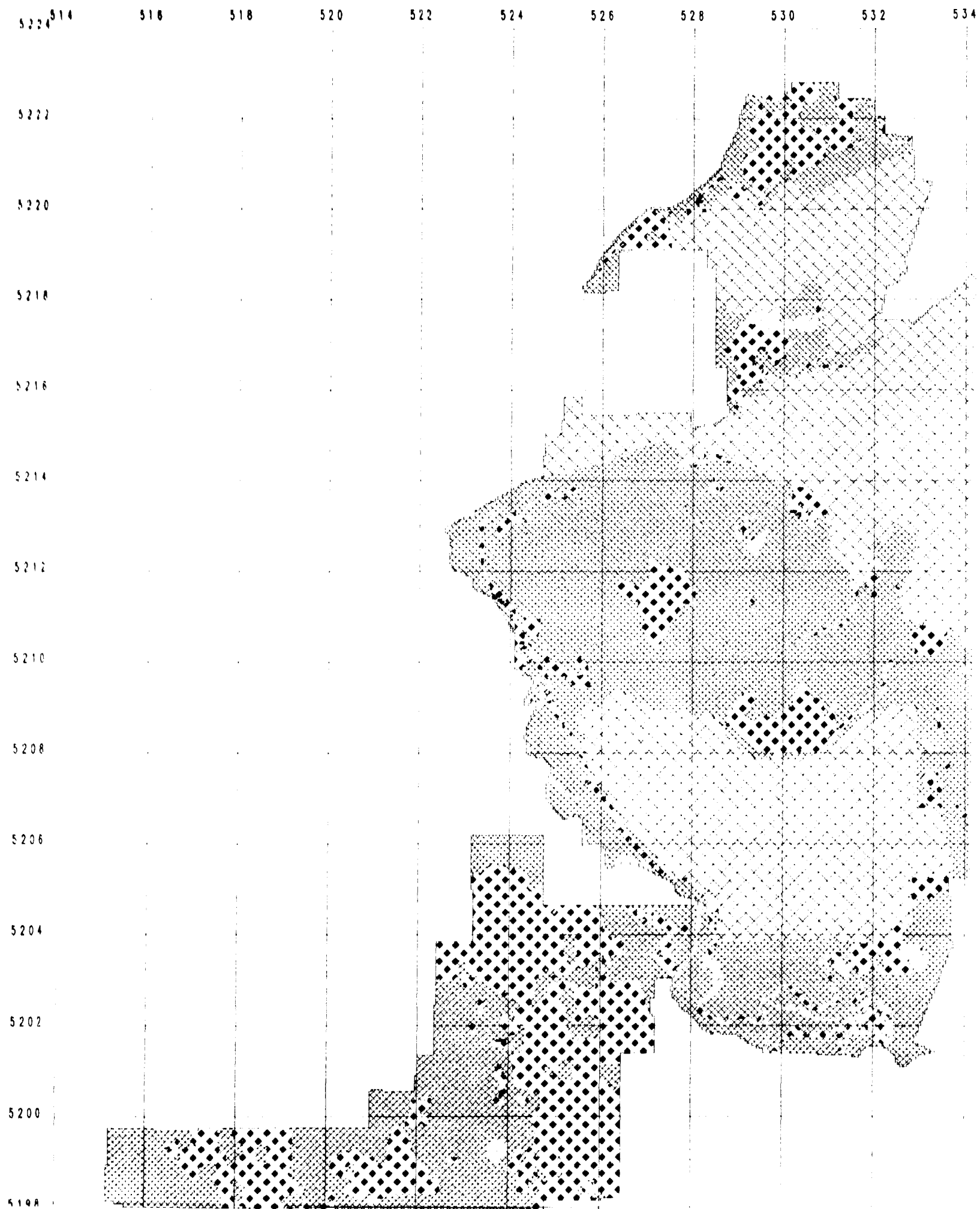
N

METERS



rfa

in the dry normal surface condition



524

526

528

530

532

534

536

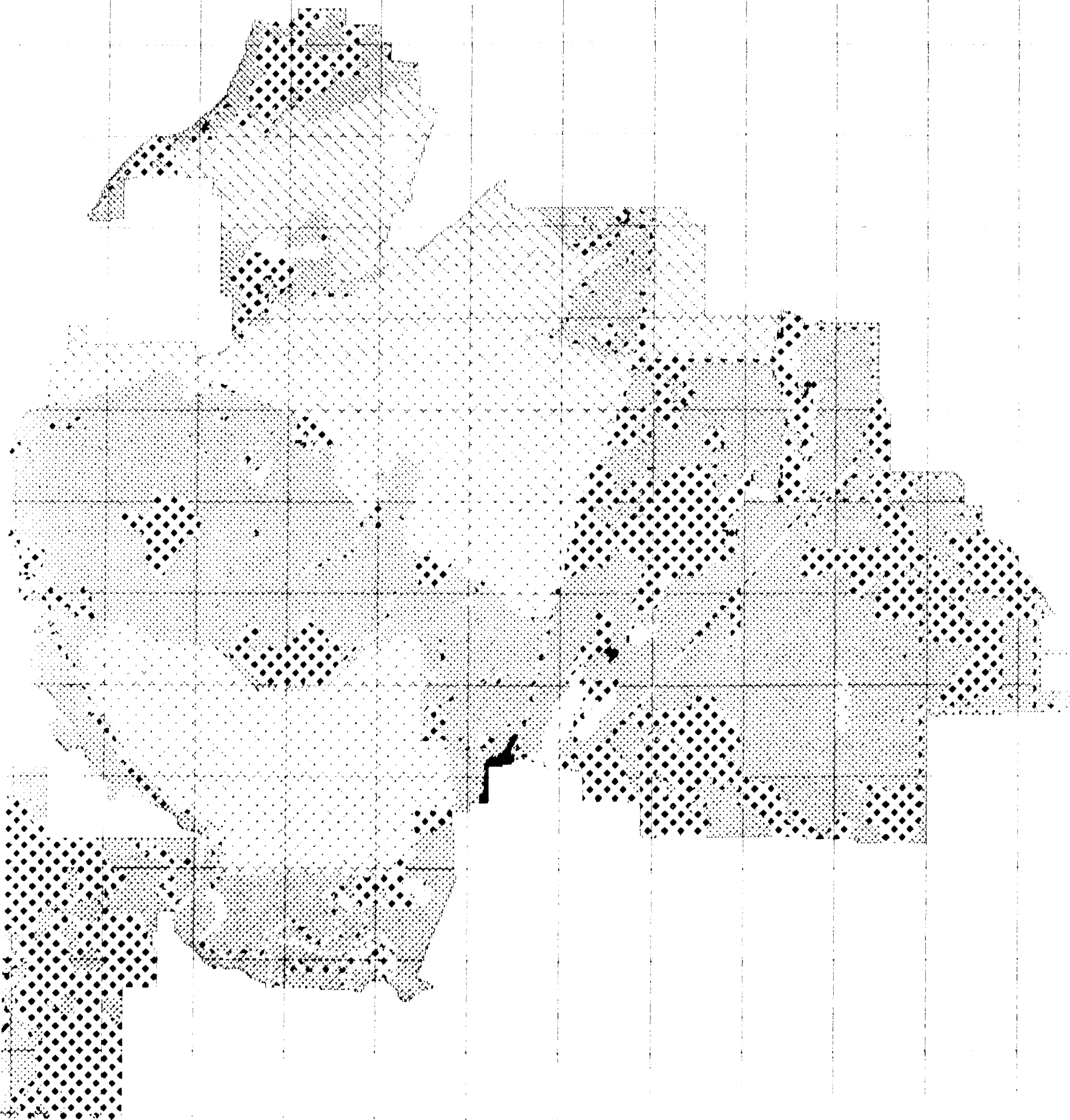
538

540

542

544

546



548

548

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL DISTURBANCE LEVELS

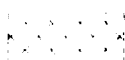
SCALE 1:100000



NOGO



HIGH
(>5-12 in)



MINIMUM
(0-.5 in)



SEVERE
(>12 in)



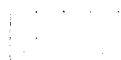
SLIGHT
(.5-2 in)



URBAN/
OFF LIMITS



MODERATE
(>2-5 in)



WATER

FT LEWIS, WASHINGTON

4-3-3 FORCE STRUCTURE

DRY SEASON

NORMAL CONDITION

1000 PASSES

5214
5212
5210
5208
5206
5204
5202
5200
5198
5196
5194
5192
514

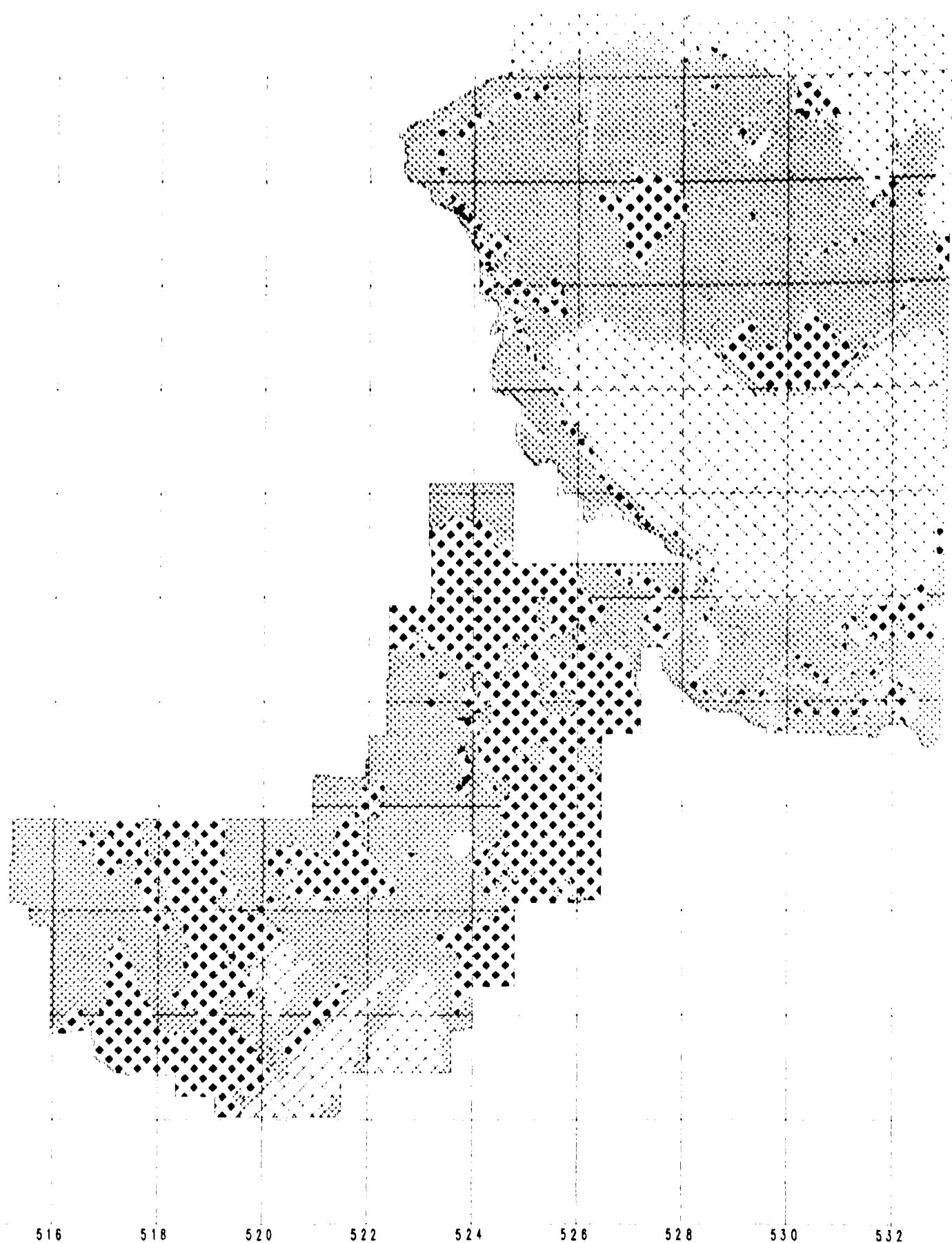
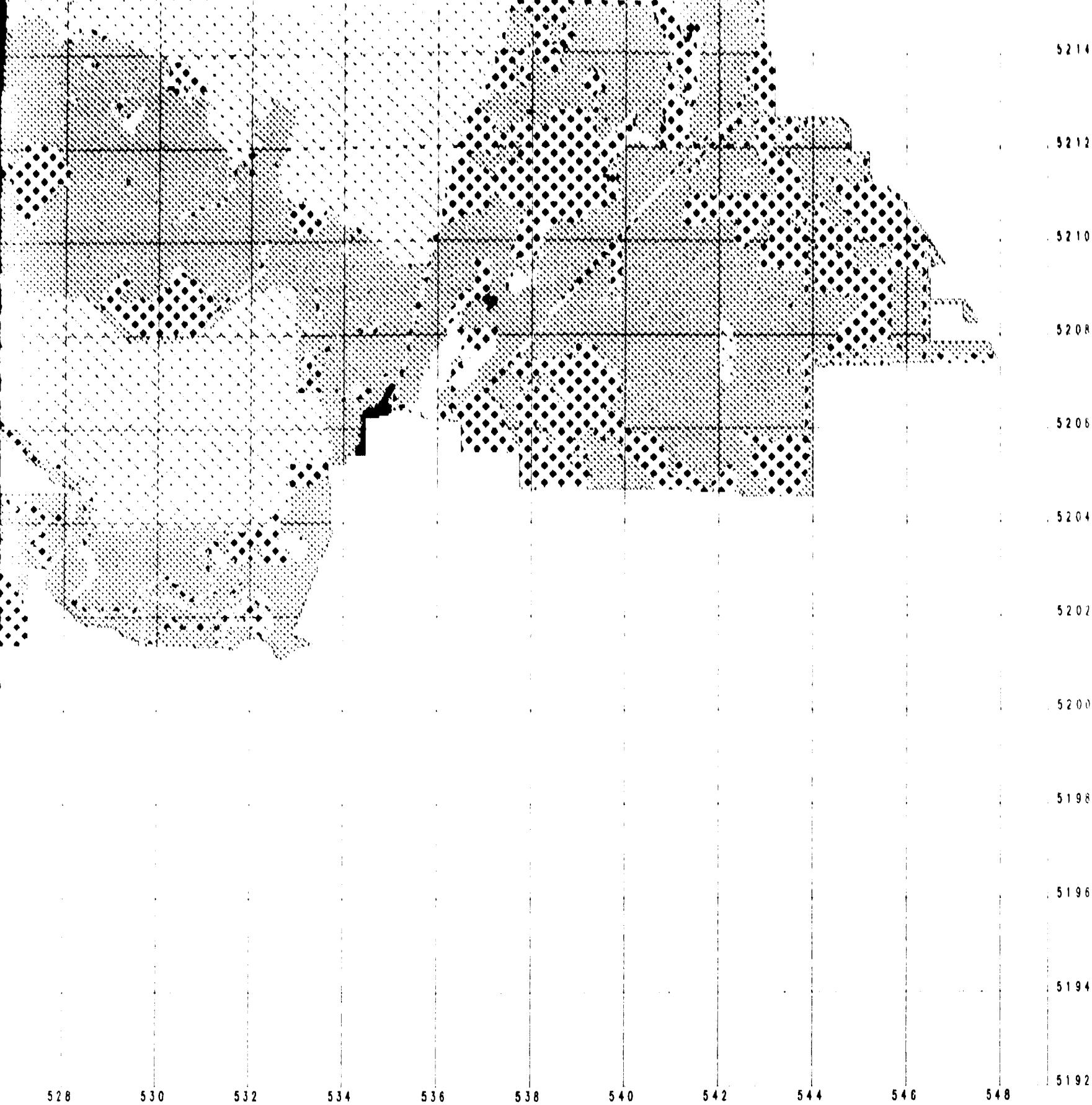


Plate 23. One thousand pass soil disturbance 1



pass soil disturbance level map for the 4-3-3 (8X8) force structure in the dry normal surface

5214

SLIGHT
(5-2 in)

URBAN
OFF LIMITS

MODERATE
(2-5 in)

MODERATE
(2-5 in)

WATER

5212

5210

5208

FT LEWIS, WASHINGTON

4-3-3 FORCE STRUCTURE

5206

DRY SEASON
NORMAL CONDITION
1000 PASSES

5204

5202

5200

5198

5196

5194

5192

N

METERS



548

548

the dry normal surface condition

5234⁵¹⁴

516

518

520

522

524

526

528

530

532

5222

5220

5218

5216

5214

5212

5210

5208

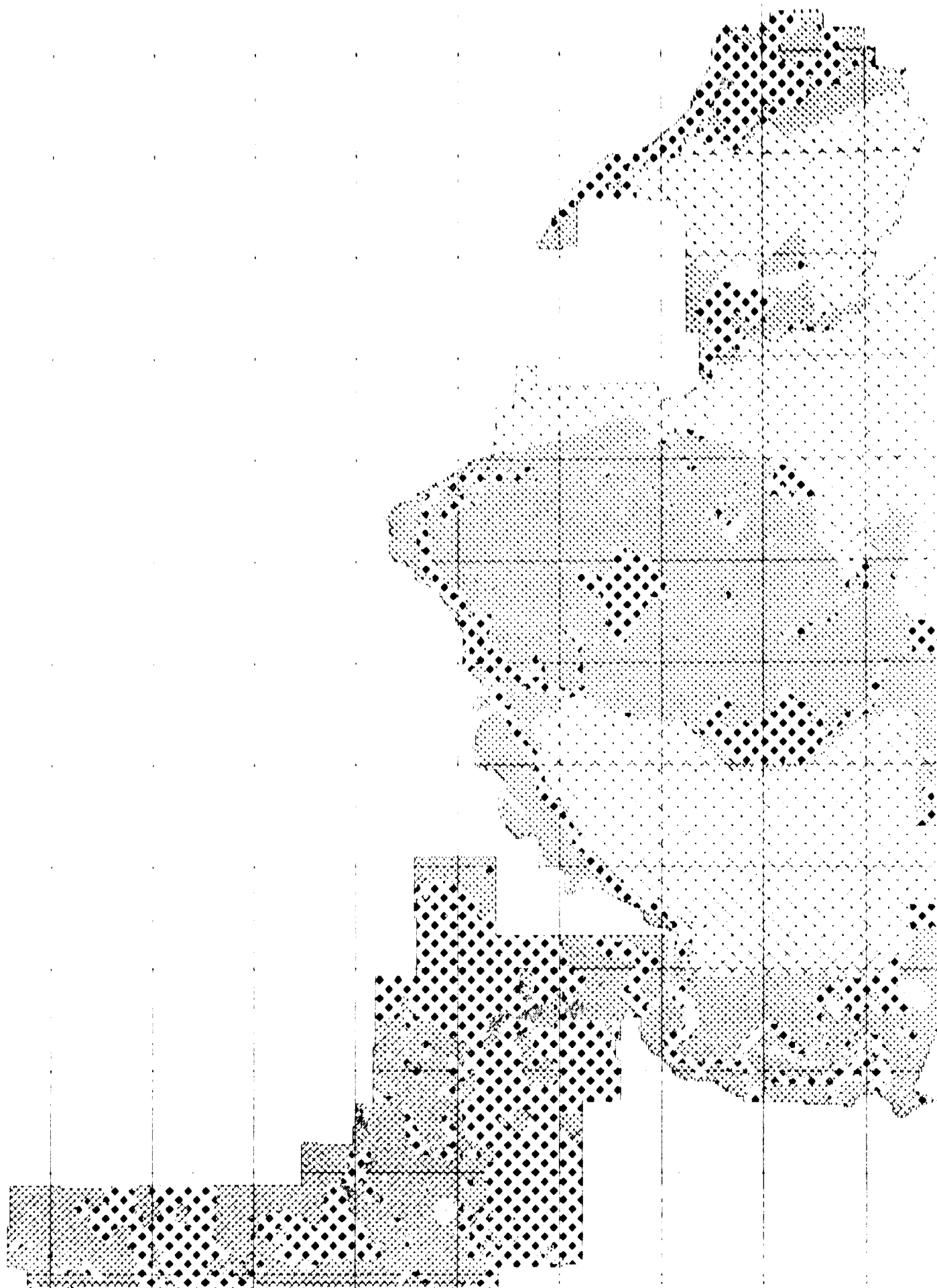
5206

5204

5202

5200

5198



524

526

528

530

532

534

536

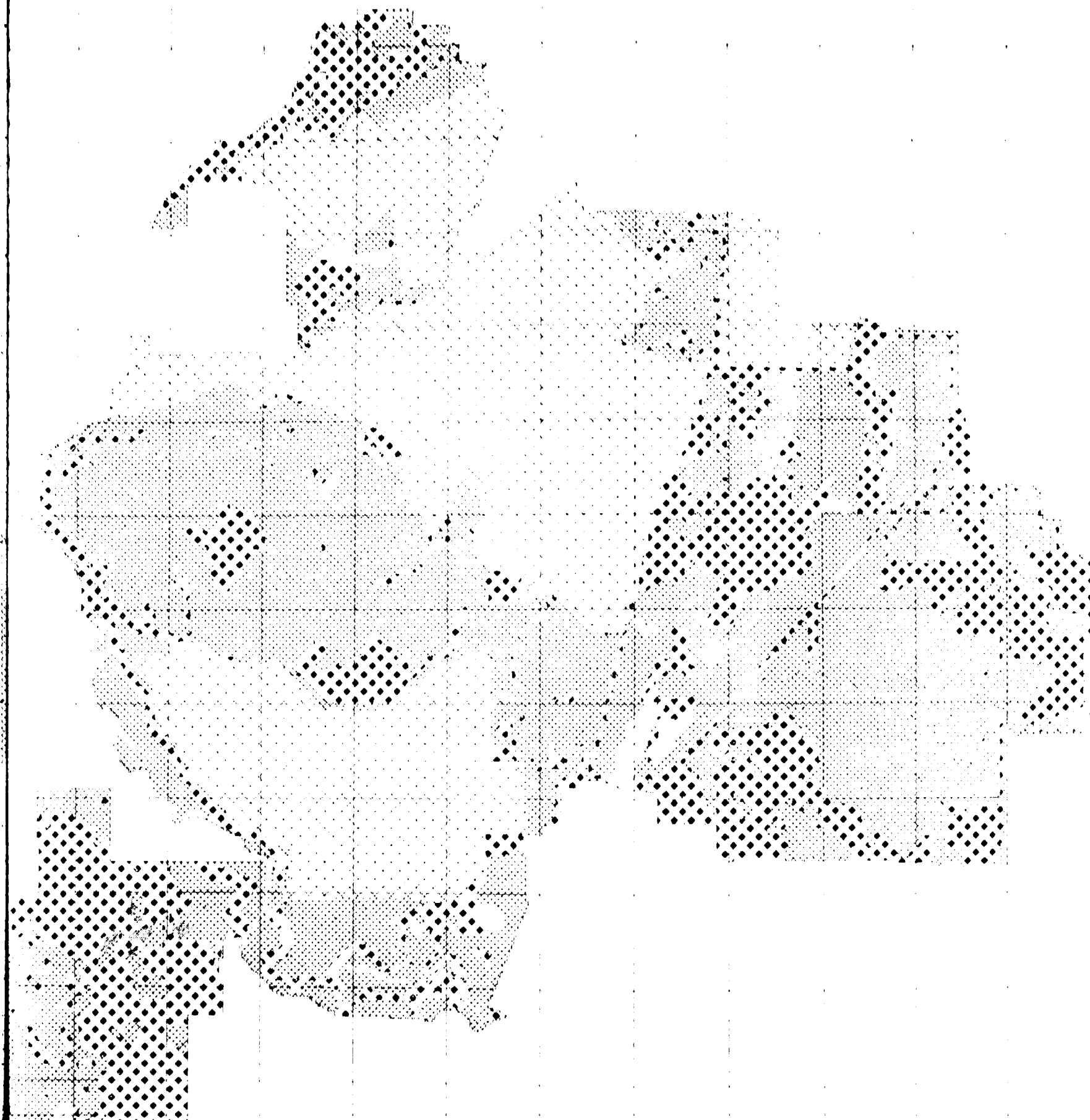
538

540

542

544

5



548

548

5224

5222

5220



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL DISTURBANCE LEVELS

SCALE 1:100000



NOGO



HIGH
(>5-12 in)



MINIMUM
(0-.5 in)



SEVERE
(>12 in)



SLIGHT
(>.5-2 in)



URBAN/
OFF LIMITS



MODERATE
(>2-5 in)



WATER

5214

5212

5210

5208

FT LEWIS, WASHINGTON

4-3-3 FORCE STRUCTURE

5206

WET SEASON
SLIPPERY CONDITION
10 PASSES

5204

5202

5200

5214
5212
5210
5208
5206
5204
5202
5200
5198
5196
5194
5192
514

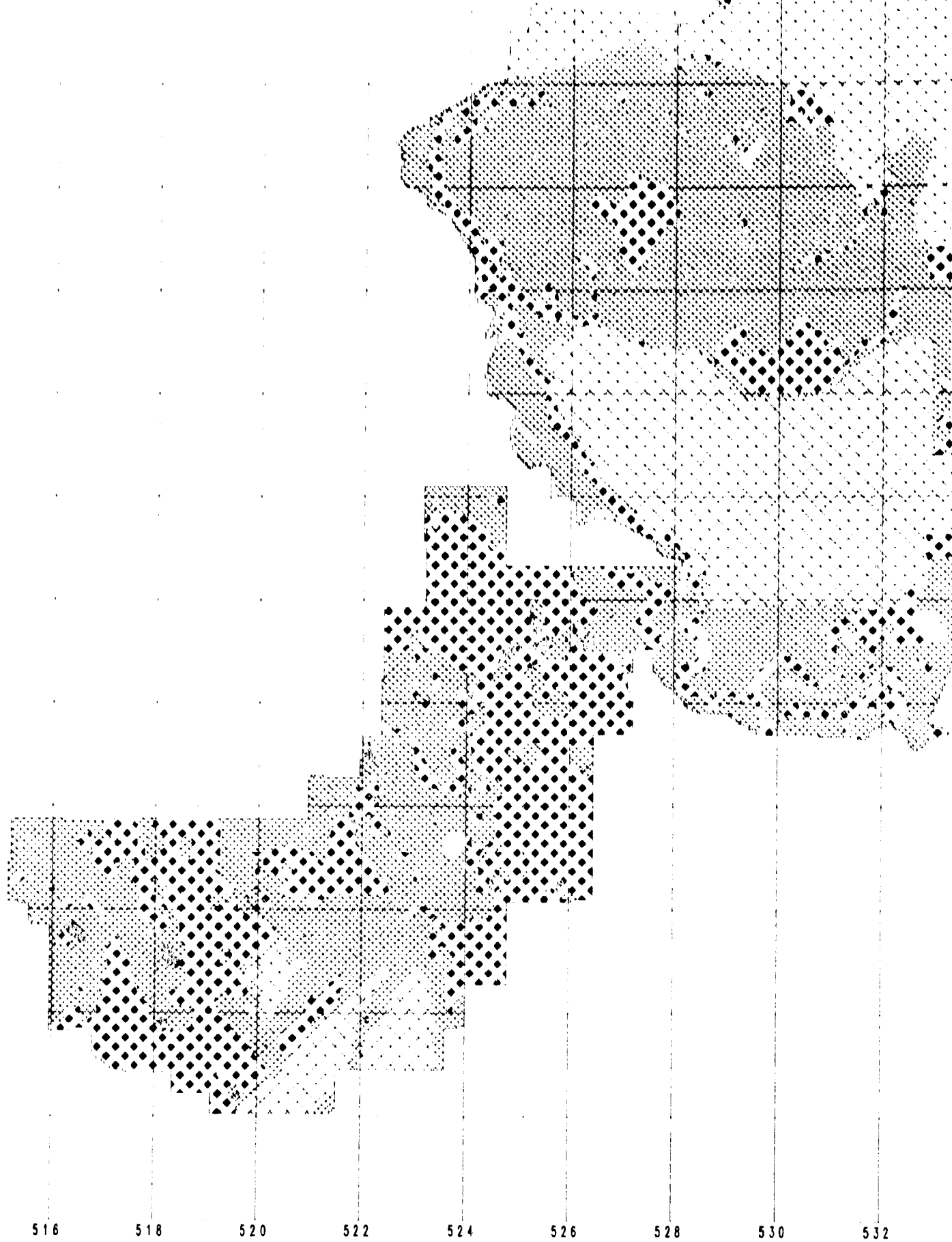
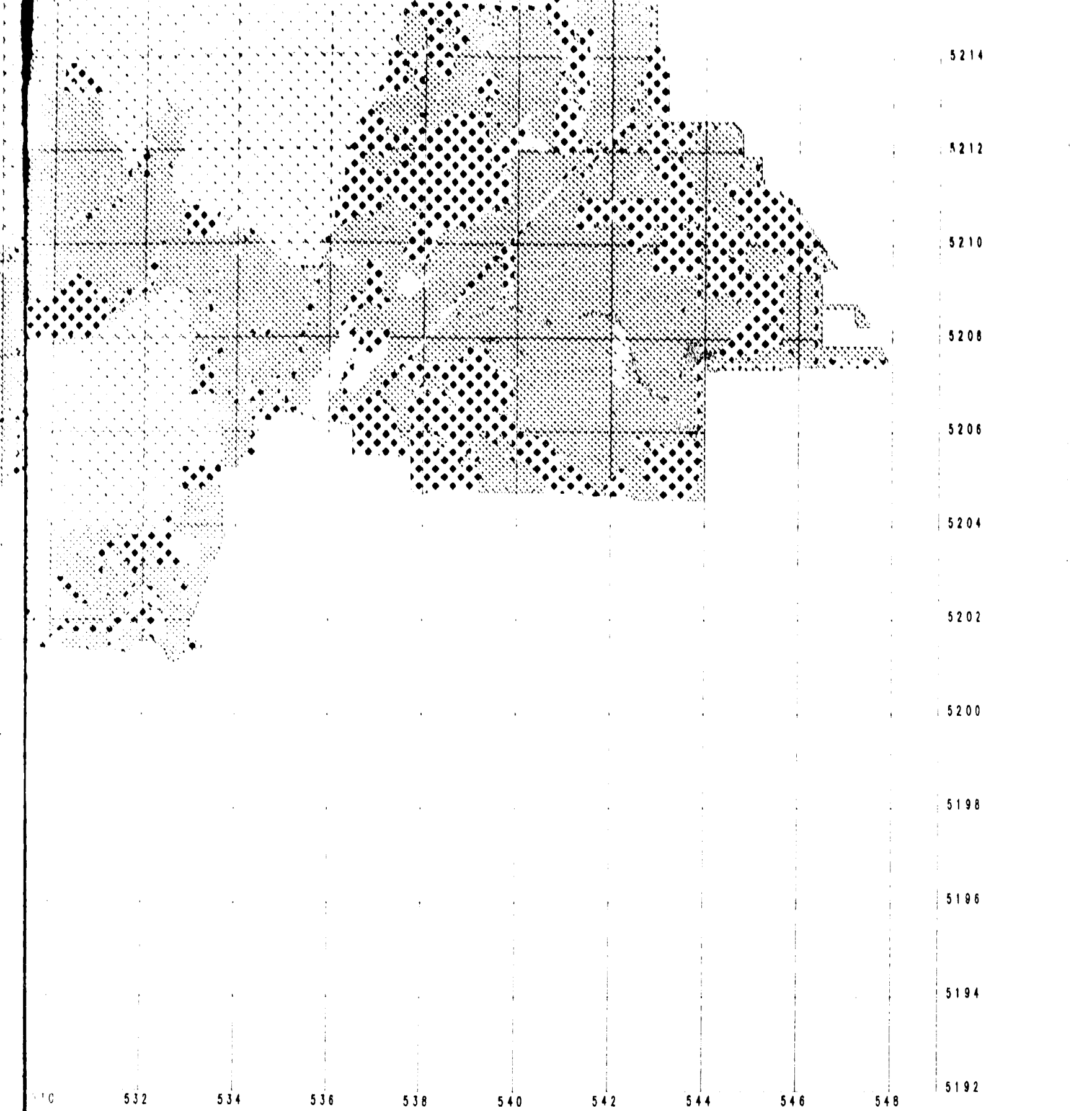


Plate 24. Ten pass soil disturbance level



disturbance level map for the 4-3-3 (8X8) force structure in the wet slippery surface con

5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

5194

5192

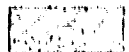
548



SLIGHT
(.5-2 in)



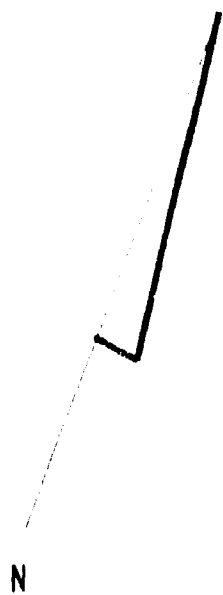
URBAN/
OFF LIMITS



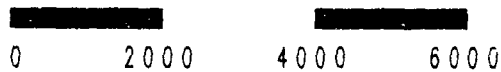
MODERATE
(2-5 in)

WATER

FT LEWIS, WASHINGTON
4-3-3 FORCE STRUCTURE
WET SEASON
SLIPPERY CONDITION
10 PASSES



METERS



to wet slippery surface condition

5224⁵¹⁴

516

518

520

522

524

526

528

530

532

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200

5198



528

530

532

534

536

538

540

542

544

546

548

5224

5222

522

521

52

52

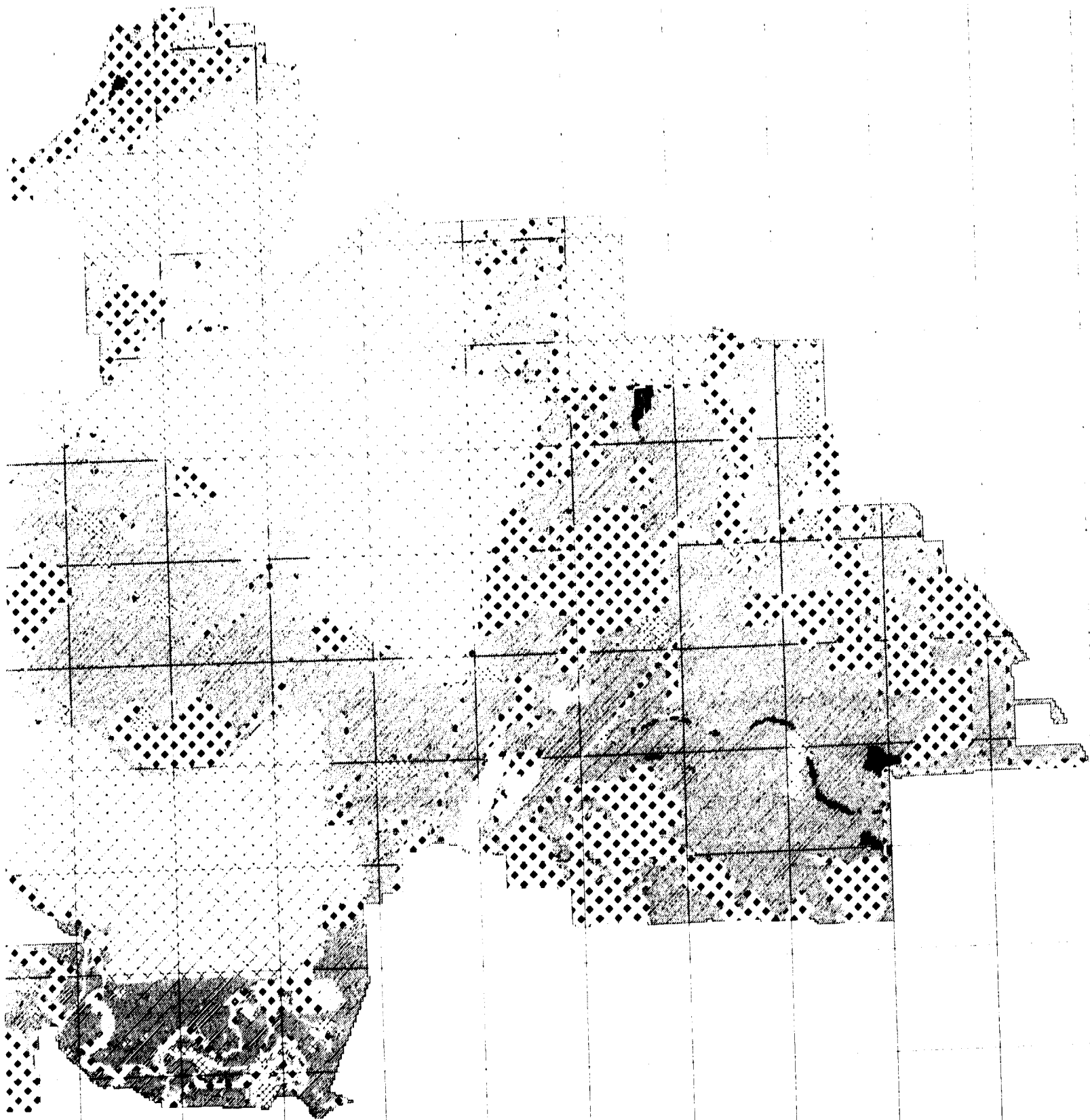
52

52

5

5

5





U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL DISTURBANCE LEVELS

SCALE 1:100000



NOGO



HIGH
(>5-12 in)



MINIMUM
(0-.5 in)



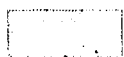
SEVERE
(>12 in)



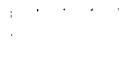
SLIGHT
(.5-2 in)



URBAN/
OFF LIMITS



MODERATE
(2-5 in)



WATER

FT LEWIS, WASHINGTON
4-3-3 FORCE STRUCTURE
WET SEASON
SLIPPERY CONDITION
50 PASSES

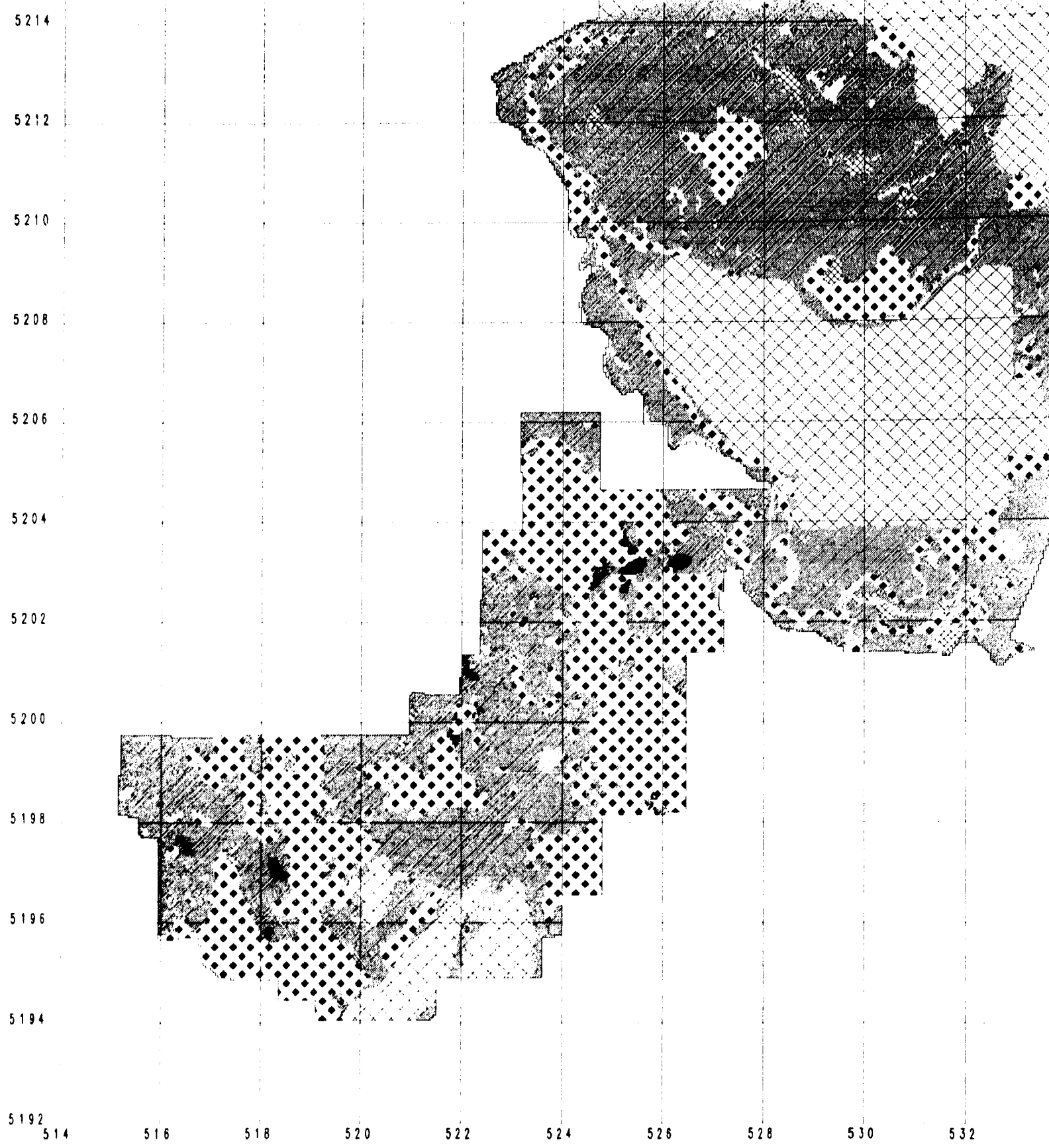
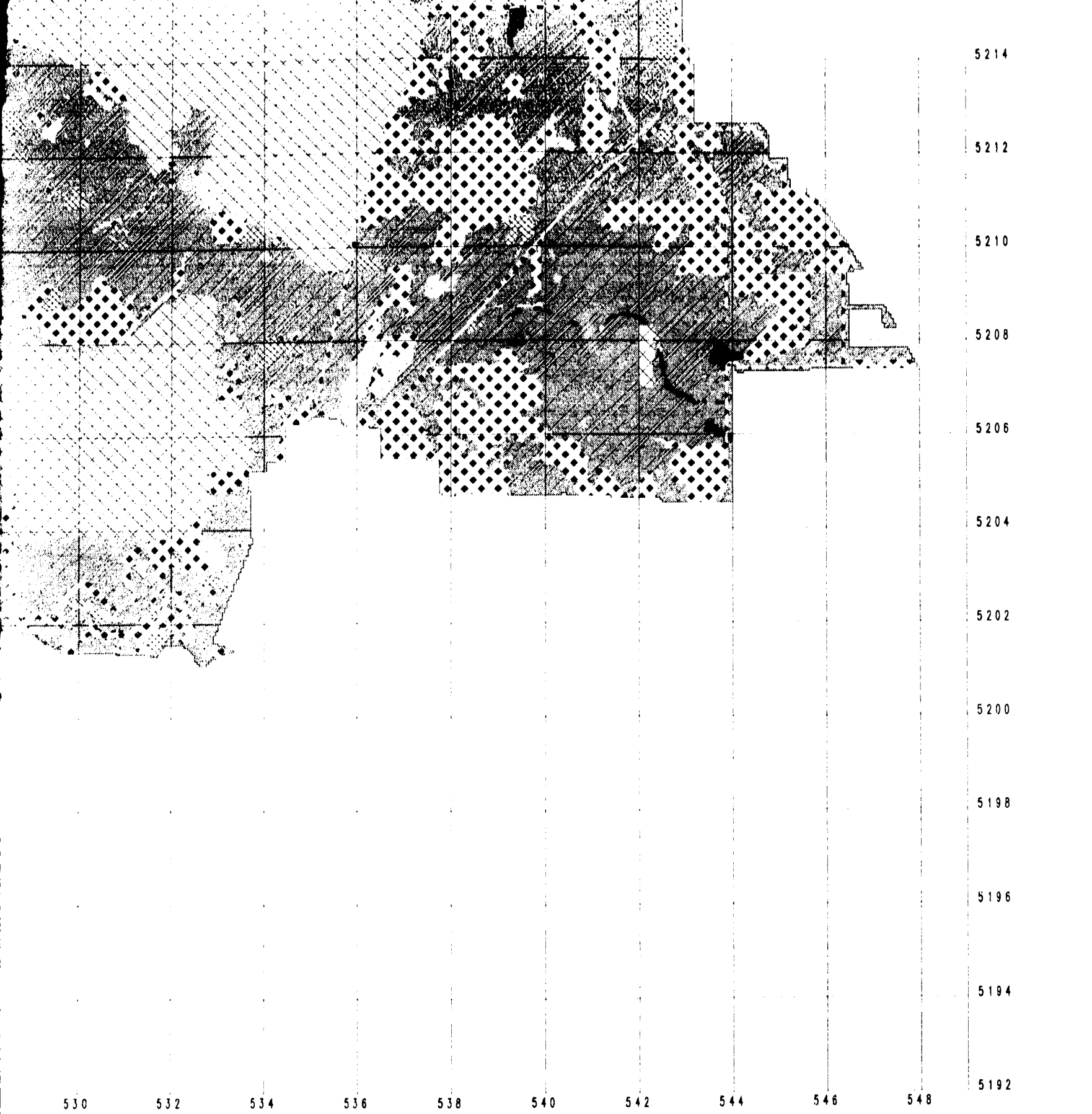
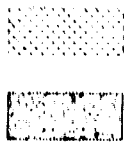


Plate 25. Fifty pass soil disturbance level



soil disturbance level map for the 4-3-3 (8X8) force structure in the wet slippery surface con

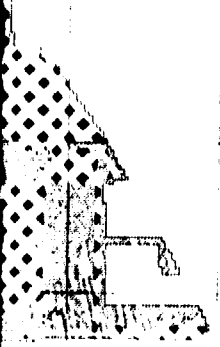
5214
5212
5210
5208
5206
5204
5202
5200
5198
5196
5194
5192



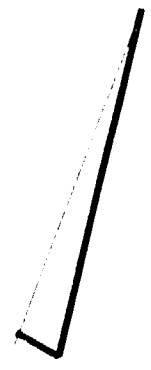
SLIGHT
(>.5-2in)
MODERATE
(>2-5in)



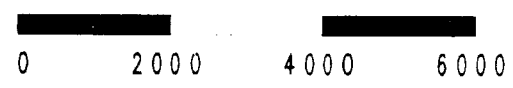
URBAN/
OFF LIMITS
WATER



FT LEWIS, WASHINGTON
4-3-3 FORCE STRUCTURE
WET SEASON
SLIPPERY CONDITION
50 PASSES



METERS



N

546 548

wet slippery surface condition

5224 514 516 518 520 522 524 526 528 530 532 534

5222

5220

5218

5216

5214

5212

5210

5208

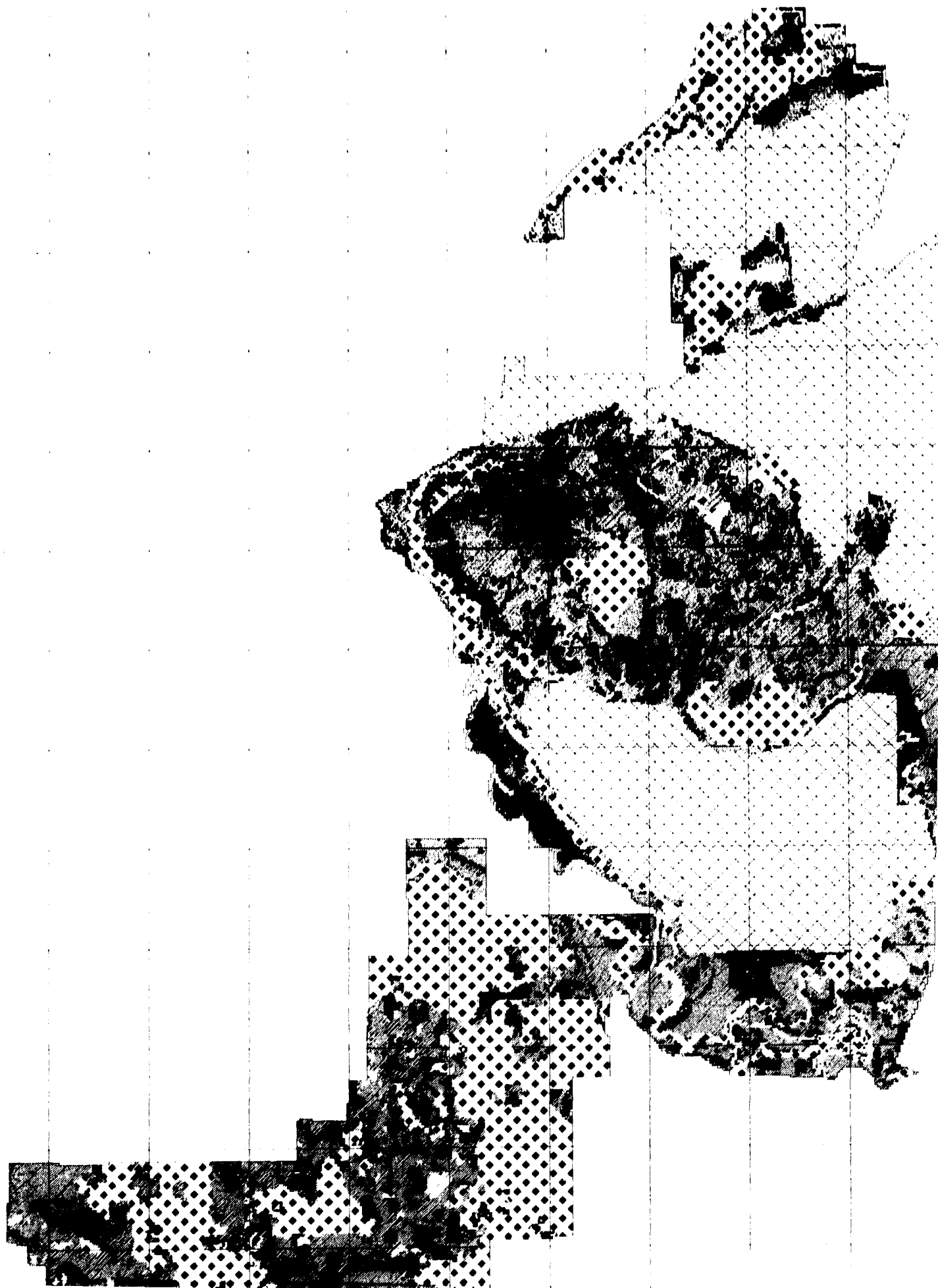
5206

5204

5202

5200

5198



528

530

532

534

536

538

540

542

544

546

548

5

5

5

5

5

5

5

5

5

5

5

5

5

5



548

548

5224

5222

5220



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL DISTURBANCE LEVELS

SCALE 1:100000



NOGO



HIGH
(>5-12 in)



MINIMUM
(0-.5 in)



SEVERE
(>12 in)



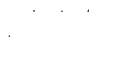
SLIGHT
(.5-2 in)



URBAN/
OFF LIMITS



MODERATE
(2-5 in)



WATER

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200

FT LEWIS, WASHINGTON
4-3-3 FORCE STRUCTURE

WET SEASON
SLIPPERY CONDITION
1000 PASSES

5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

5194

5192
514

516

518

520

522

524

526

528

530

532



Plate 26. One thousand pass soil disturbance le



5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

5194

5192

530

532

534

536

538

540

542

544

546

548

soil disturbance level map for the 4-3-3 (8X8) force structure in the wet slippery surface

5214

SLIGHT
(.5-2 in)

URBAN/
OFF LIMITS

MODERATE
(2-5 in)

WATER

5212

5210

5208

FT LEWIS, WASHINGTON
4-3-3 FORCE STRUCTURE

5206

WET SEASON
SLIPPERY CONDITION
1000 PASSES

5204

5202

5200

5198

5196

5194

5192

METERS

0 2000 4000 6000

N

546

548

on the wet slippery surface condition

5224⁵¹⁴

516

518

520

522

524

526

528

530

532

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200

5198



526

528

530

532

534

536

538

540

542

544

546

548



52 546 548 5224

52 5222

52 5220

52 5218

52 5216

52 5214

52 5212

52 5210

52 5208

52 5206

52 5204

52 5202

52 5200

5 5198



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL DISTURBANCE LEVELS

SCALE 1:100000



NOGO



HIGH
(>5-12 in)



MINIMUM
(0-.5 in)



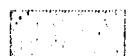
SEVERE
(>12 in)



SLIGHT
(>.5-2 in)



URBAN/
OFF LIMITS



MODERATE
(>2-5 in)



WATER

FT LEWIS, WASHINGTON

5-5-0 FORCE STRUCTURE

DRY SEASON

NORMAL CONDITION

10 PASSES

5214
5212
5210
5208
5206
5204
5202
5200
5198
5196
5194
5192

514

516

518

520

522

524

526

528

530

532

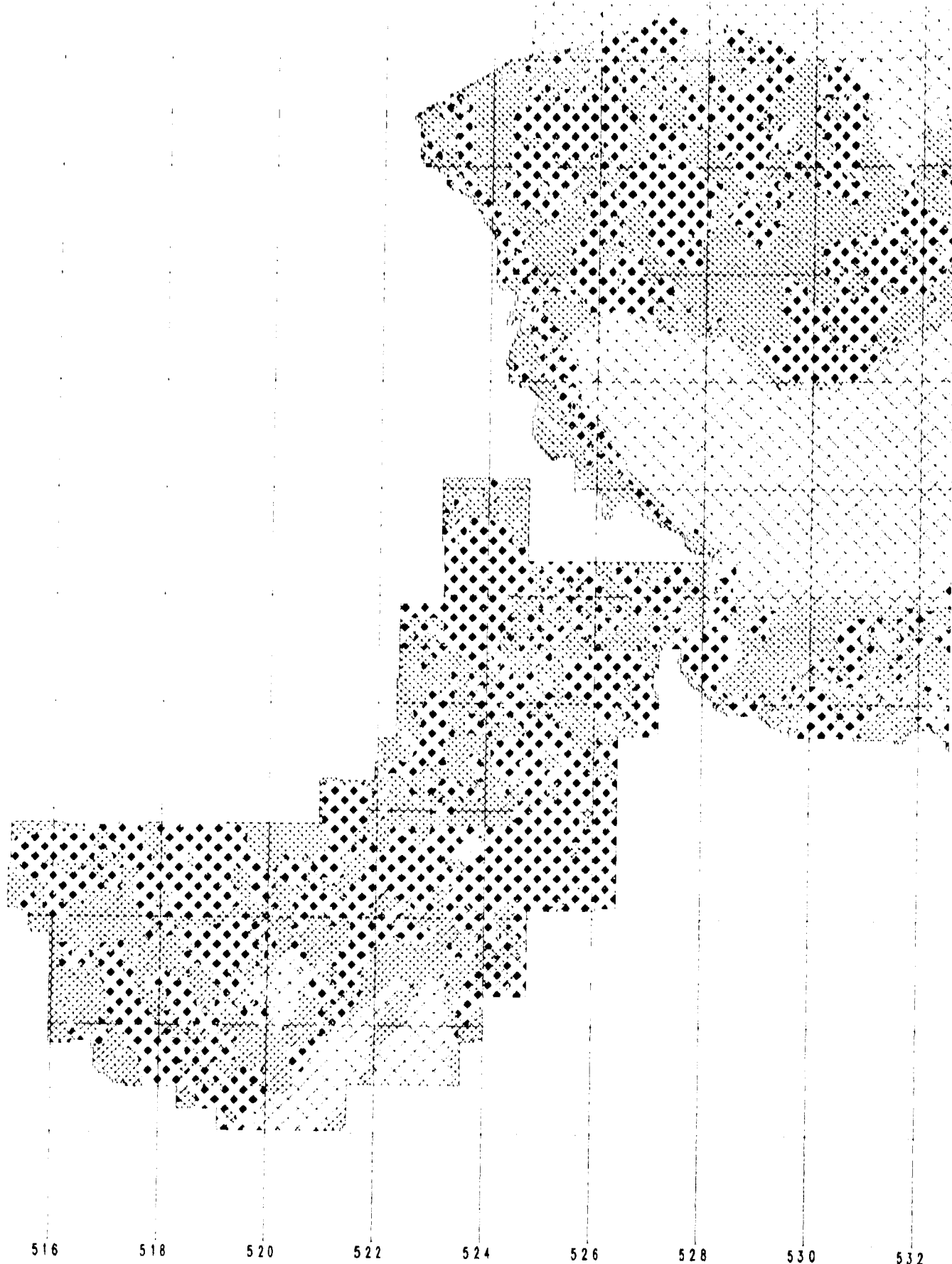
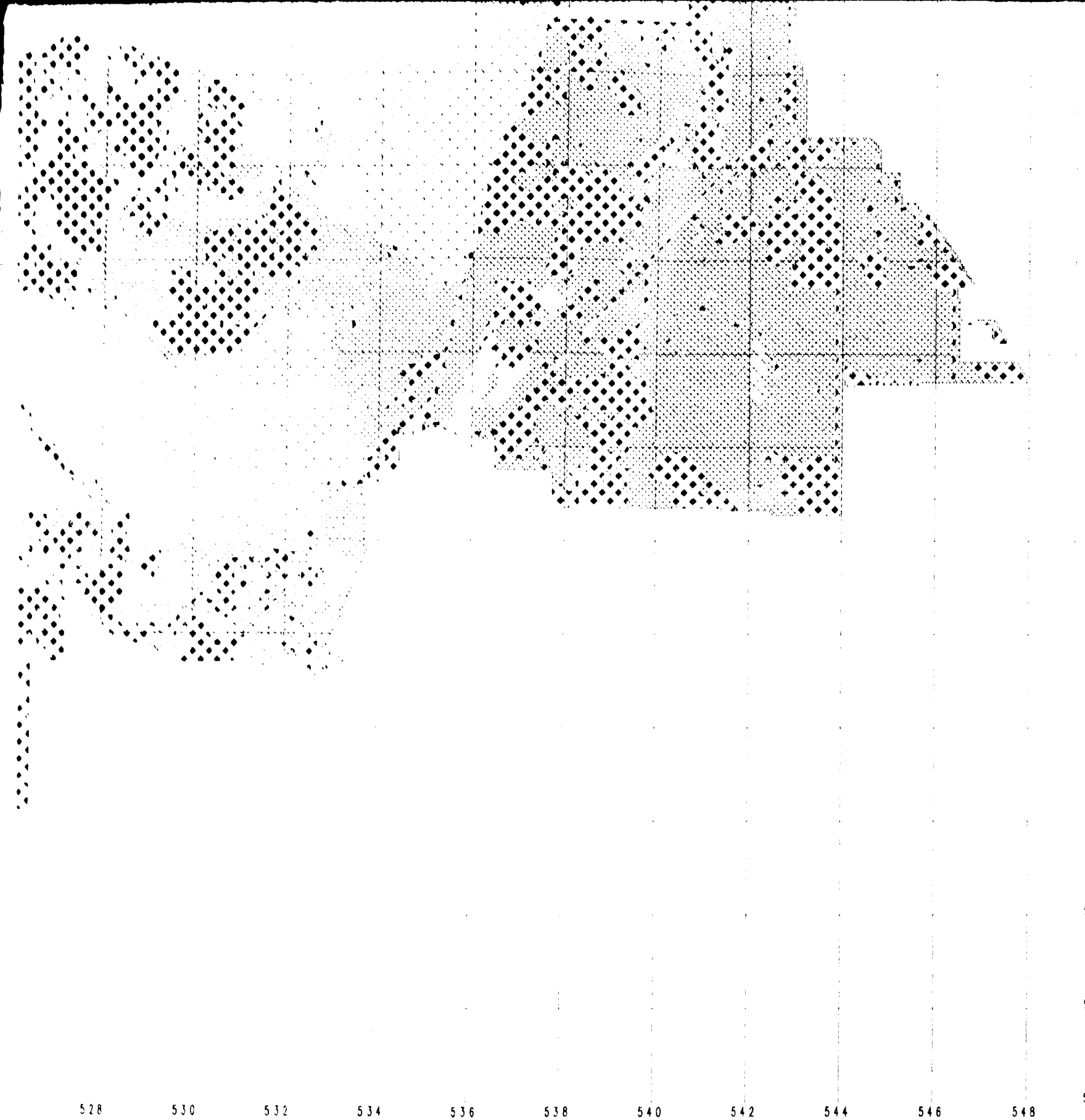
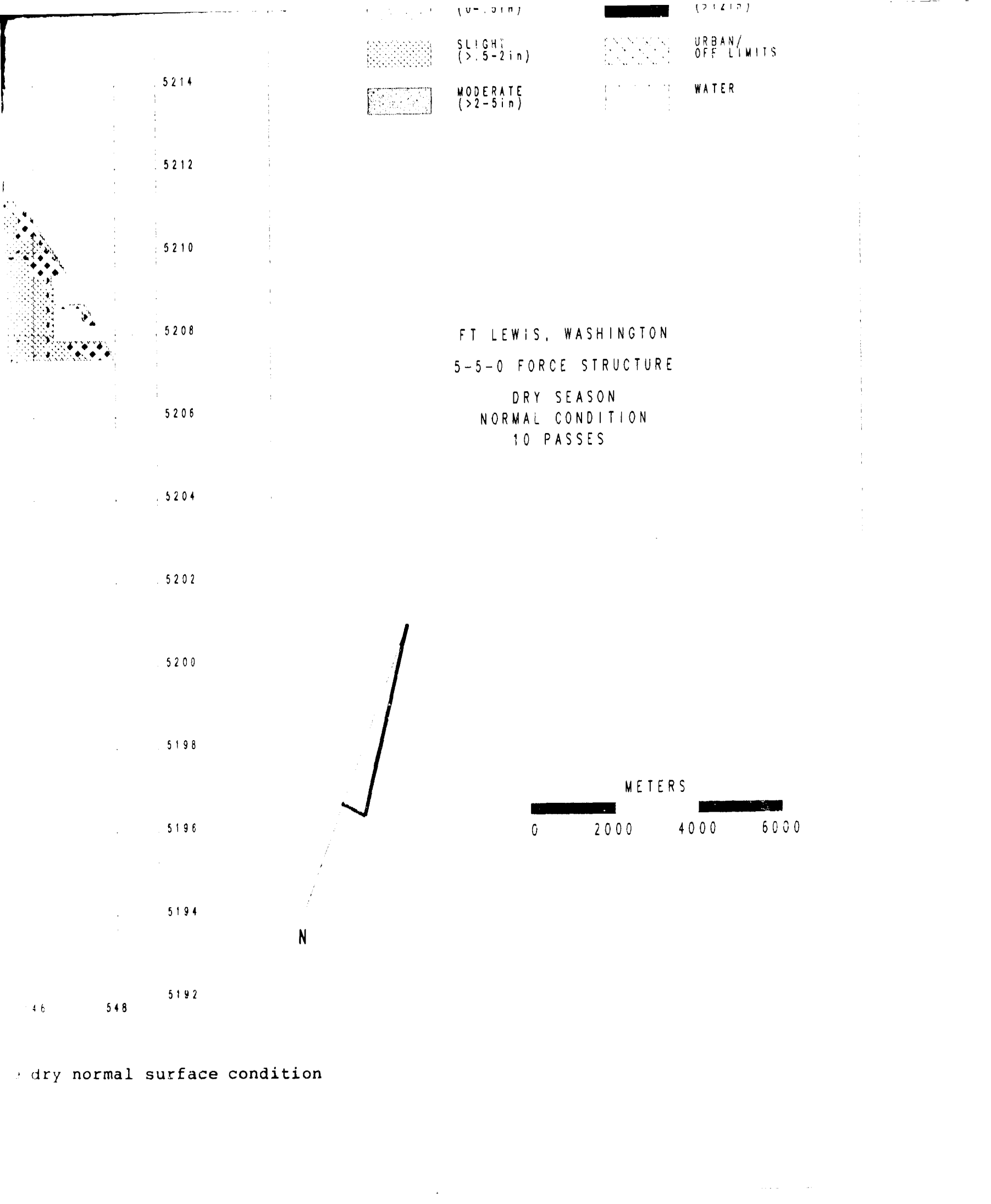
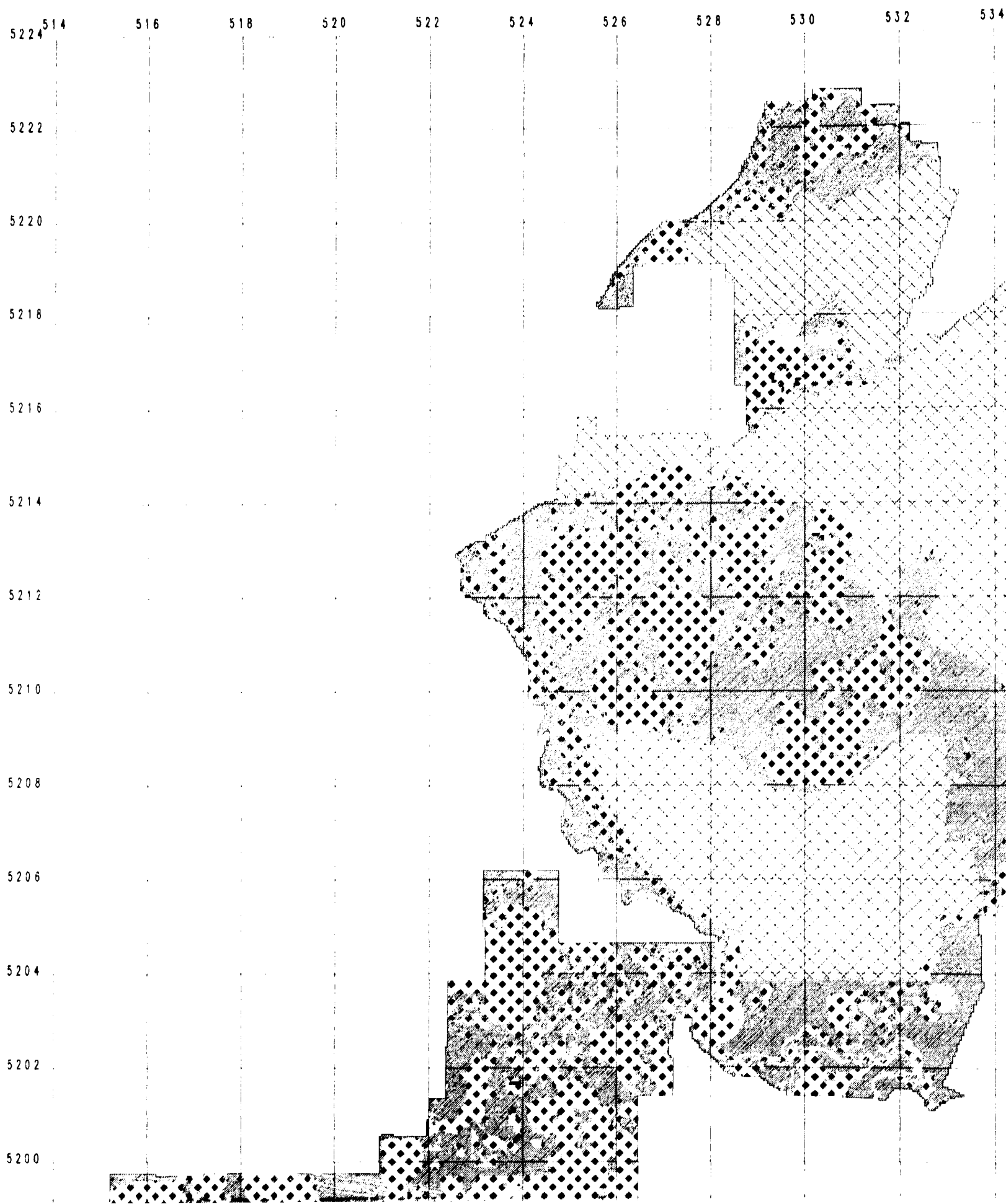


Plate 27. Ten pass soil distur



17. Ten pass soil disturbance level map for the 5-5-0 force structure in the dry normal sur





528

530

532

534

536

538

540

542

544

546

548

5224

5222

5220

5218

5216

5214

5212

5210

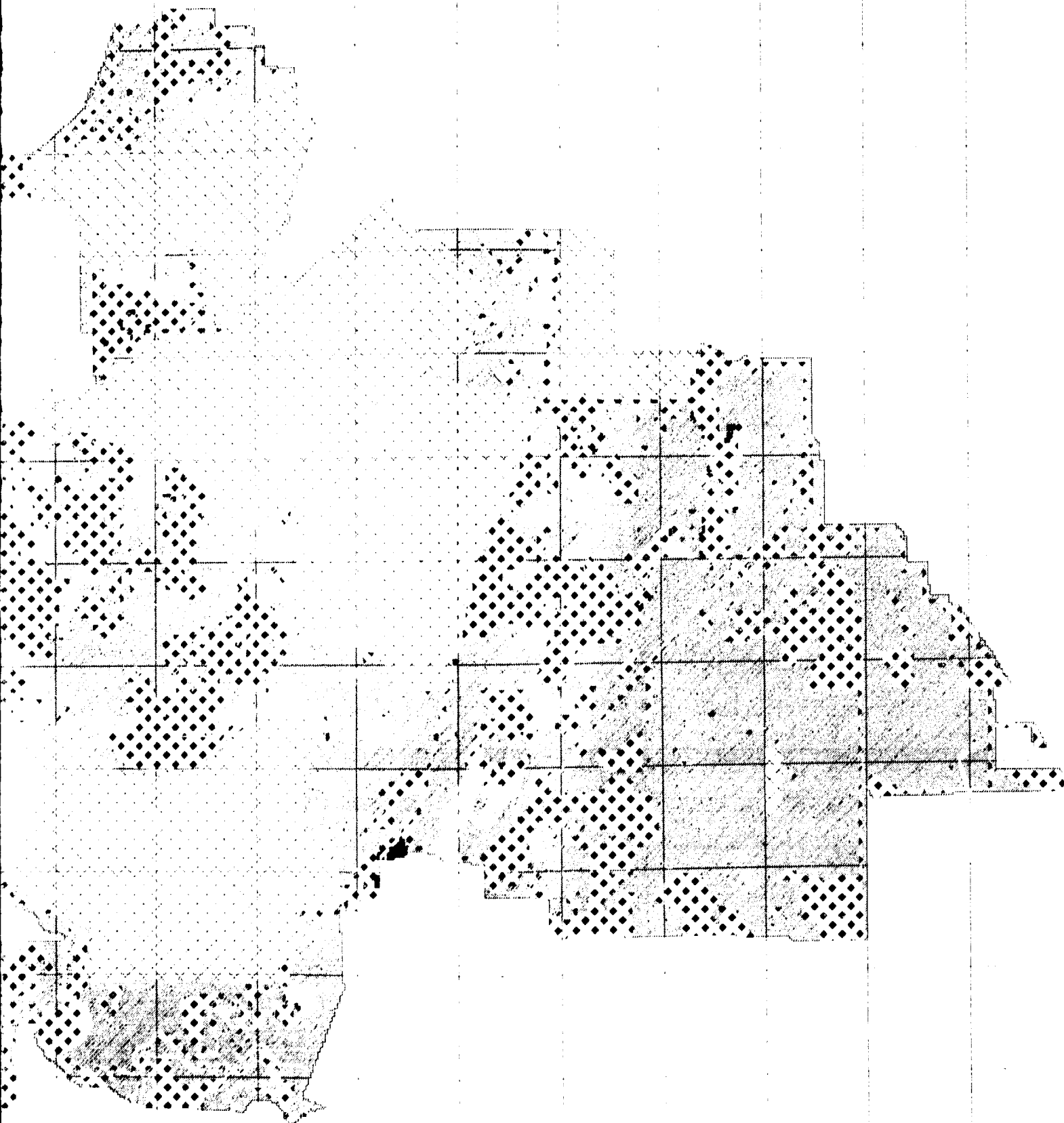
5208

5206

5204

5202

5200



548

548

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL DISTURBANCE LEVELS

SCALE 1:100000



NOGO



HIGH
(>5-12 in)



MINIMUM
(0-.5 in)



SEVERE
(>12 in)



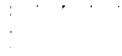
SLIGHT
(>.5-2 in)



URBAN/
OFF LIMITS



MODERATE
(>2-5 in)



WATER

FT LEWIS, WASHINGTON

5-5-0 FORCE STRUCTURE

DRY SEASON

NORMAL CONDITION

50 PASSES

5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

5194

5192
514

516

518

520

522

524

526

528

530

532

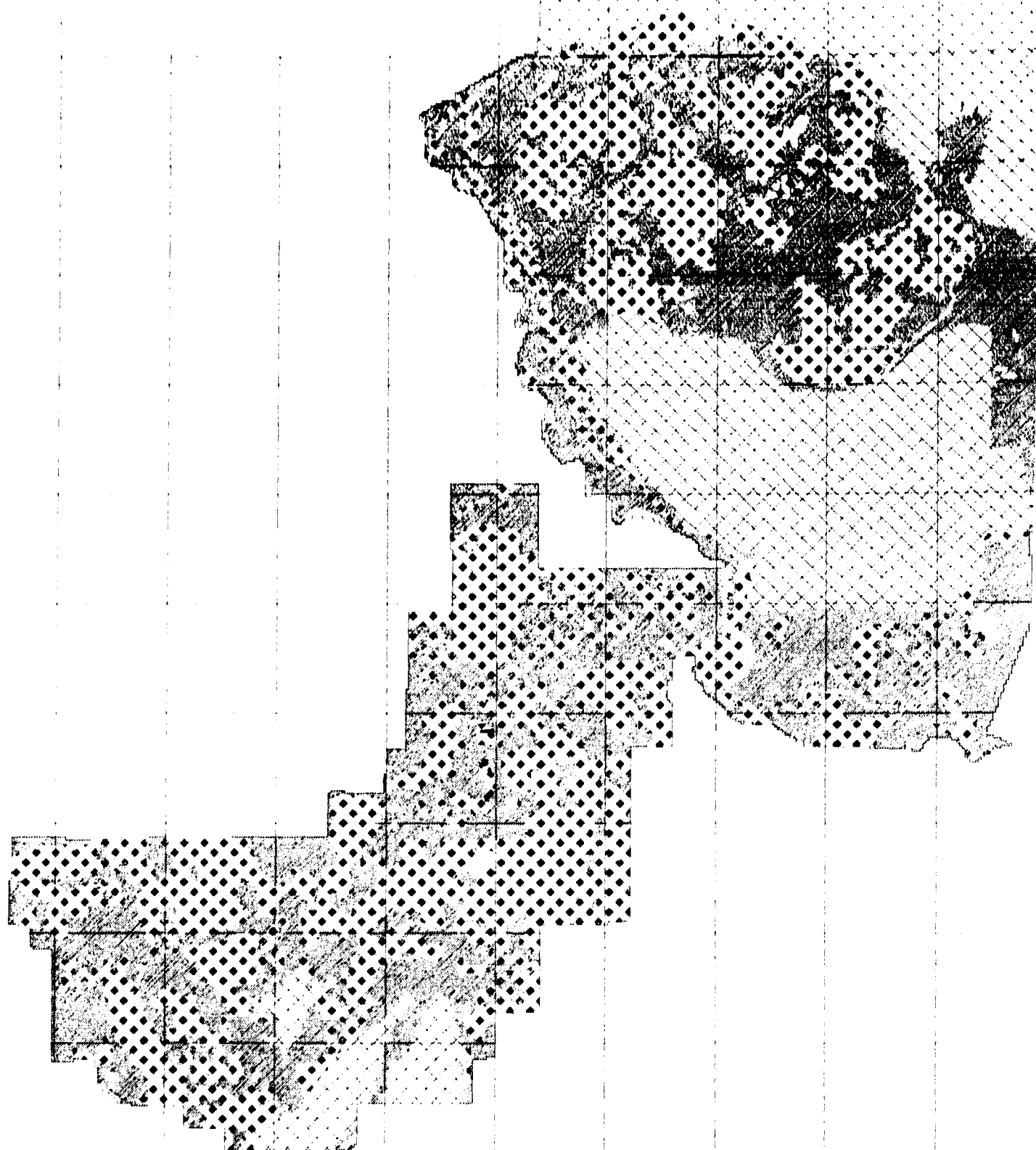
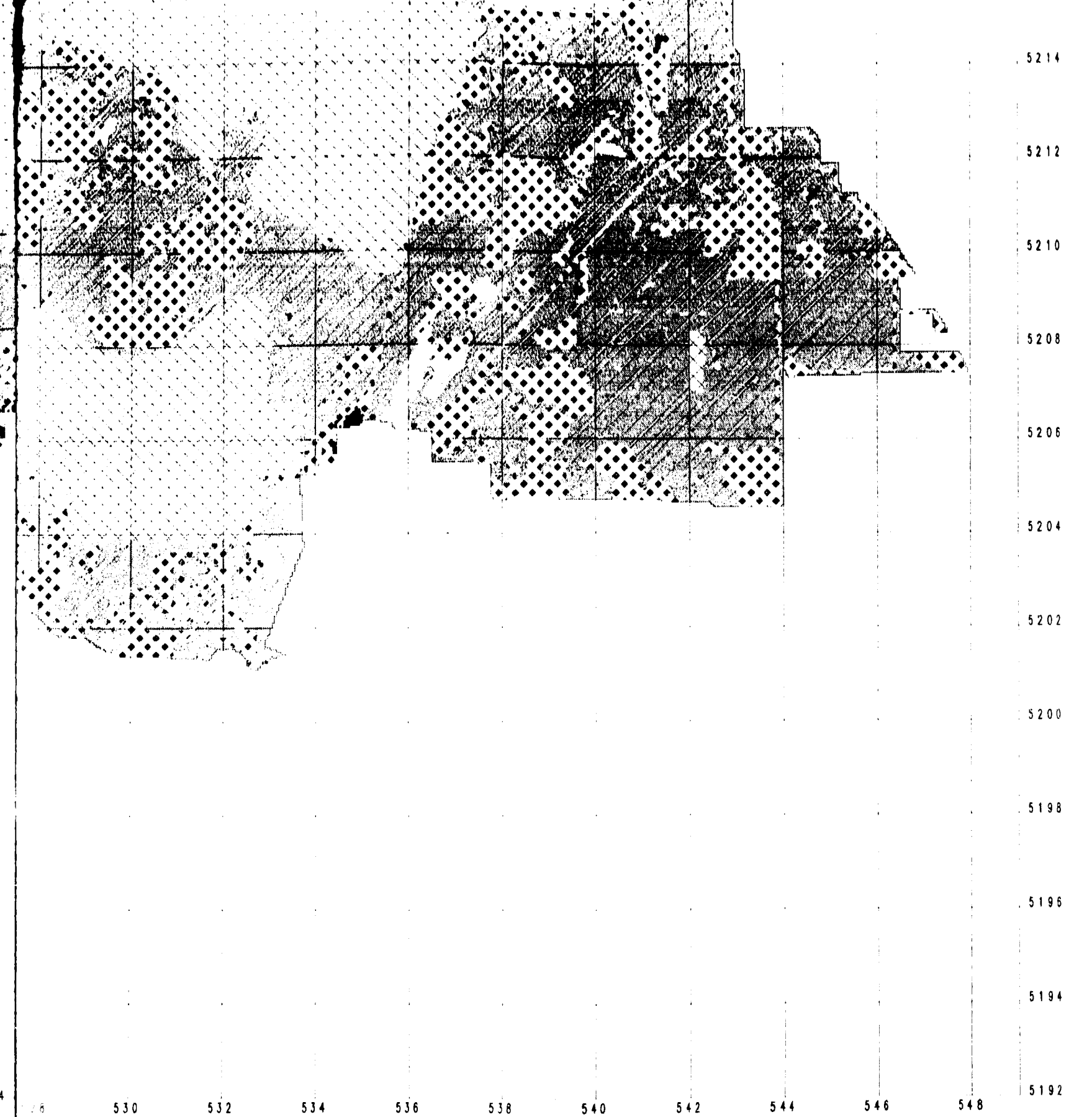
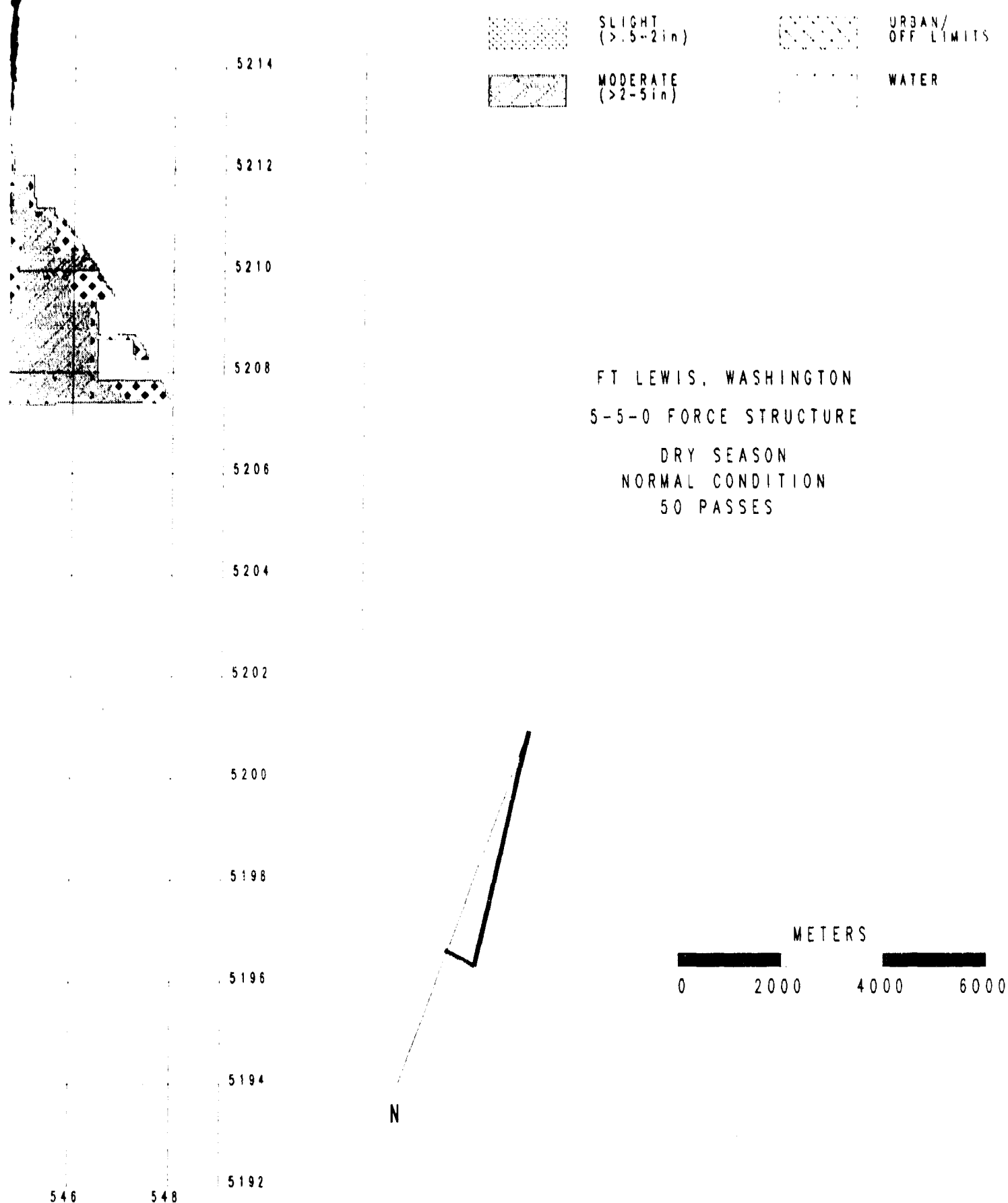


Plate 28. Fifty pass soil disturbance



pass soil disturbance level map for the 5-5-0 force structure in the dry normal surface con



ie dry normal surface condition

5224⁵¹⁴

516

518

520

522

524

526

528

530

532

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200



528

530

532

534

536

538

540

542

544

546

548

52

52

51

51

5

5

5

5

5

5

5

5

5



546

548

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL DISTURBANCE LEVELS

SCALE 1:100000



NOGO



HIGH
(>5-12 in)



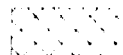
MINIMUM
(0-.5 in)



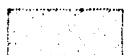
SEVERE
(>12 in)



SLIGHT
(>.5-2 in)



URBAN/
OFF LIMITS



MODERATE
(>2-5 in)



WATER

FT LEWIS, WASHINGTON

5-5-0 FORCE STRUCTURE

DRY SEASON

NORMAL CONDITION

1000 PASSES

5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

5194

5192

514

516

518

520

522

524

526

528

530

532



Plate 29. One thousand pass soil dist



528

530

532

534

536

538

540

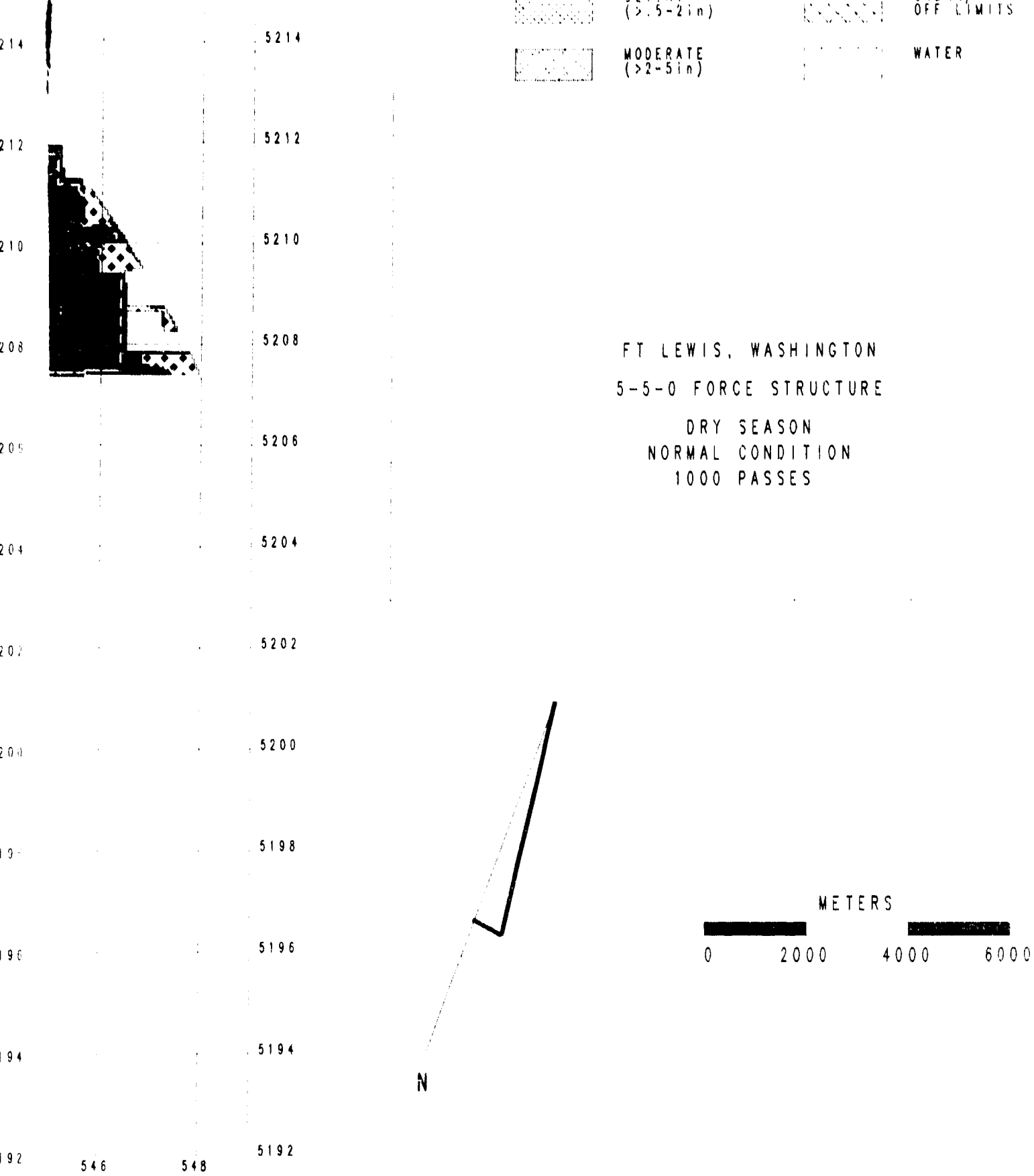
542

544

546

548

ban thousand pass soil disturbance level map for the 5-5-0 force structure in the dry normal



rfac the dry normal surface condition

514
5224

518

518

520

522

524

526

528

530

532

5222

5220

5218

5216

5214

5212

5210

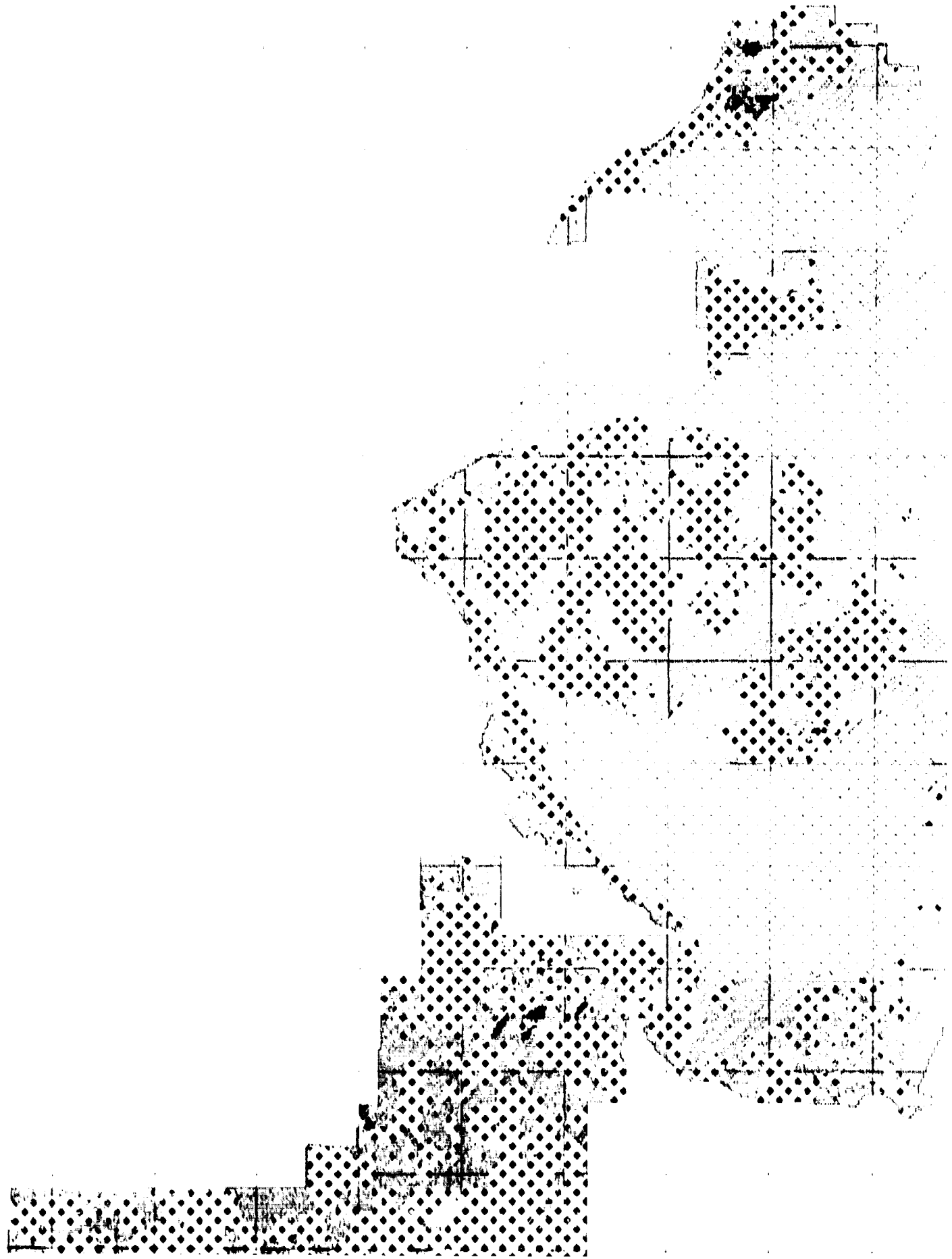
5208

5206

5204

5202

5200



528

530

532

534

536

538

540

542

544

546

548

5224

5222

5220

5218

5216

5214

5212

5210

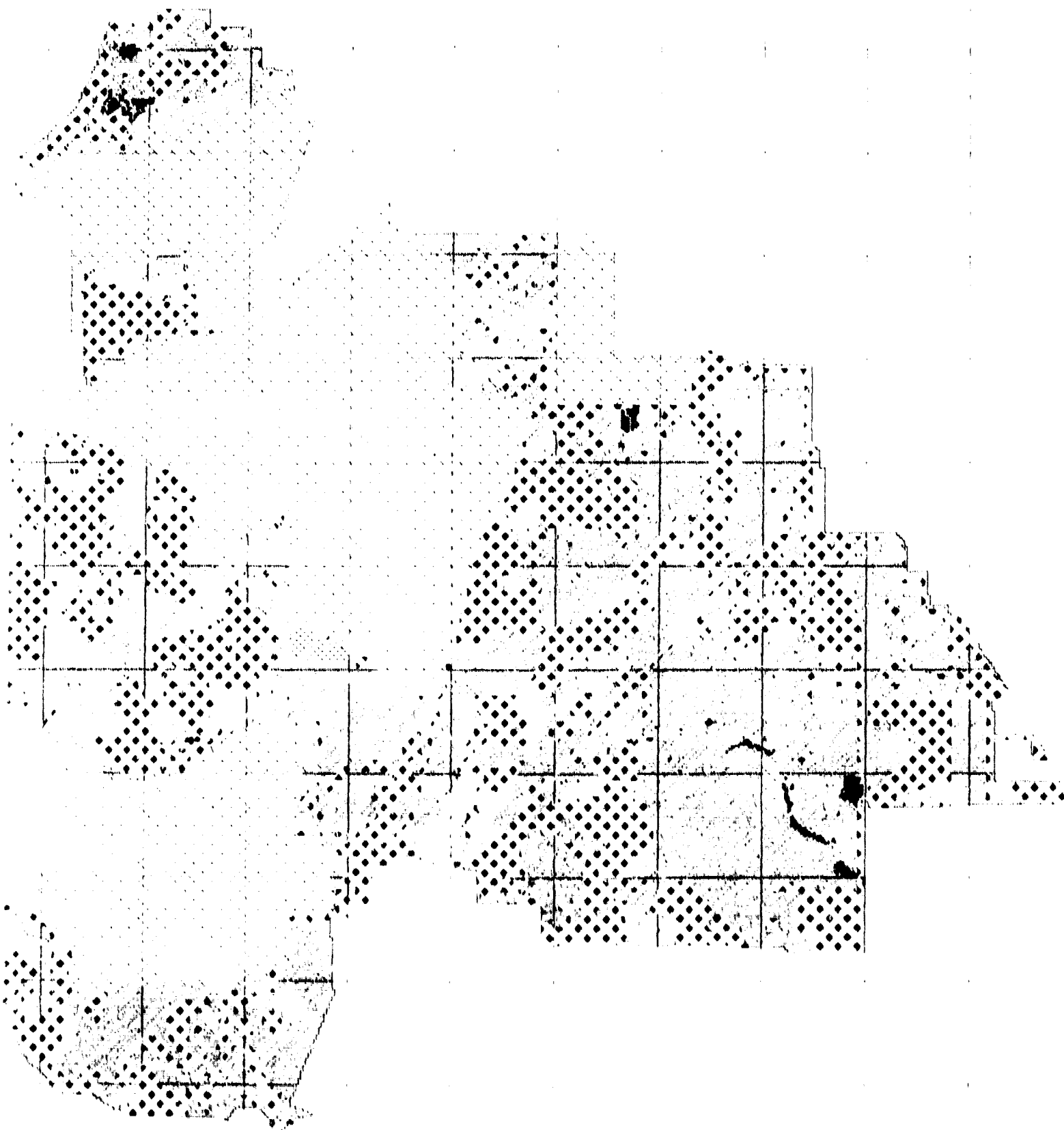
5208

5206

5204

5202

5200



546

548

5224

5222

5220



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL DISTURBANCE LEVELS

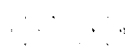
SCALE 1:100000



NOGO



HIGH
(>5-12 in)



MINIMUM
(0-.5 in)



SEVERE
(>12 in)



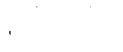
SLIGHT
(>.5-2 in)



URBAN/
OFF LIMITS



MODERATE
(>2-5 in)



WATER

5216

5214

5212

5210

5208

5206

5204

5202

5200

FT LEWIS, WASHINGTON

5-5-0 FORCE STRUCTURE

WET SEASON

SLIPPERY CONDITION

10 PASSES

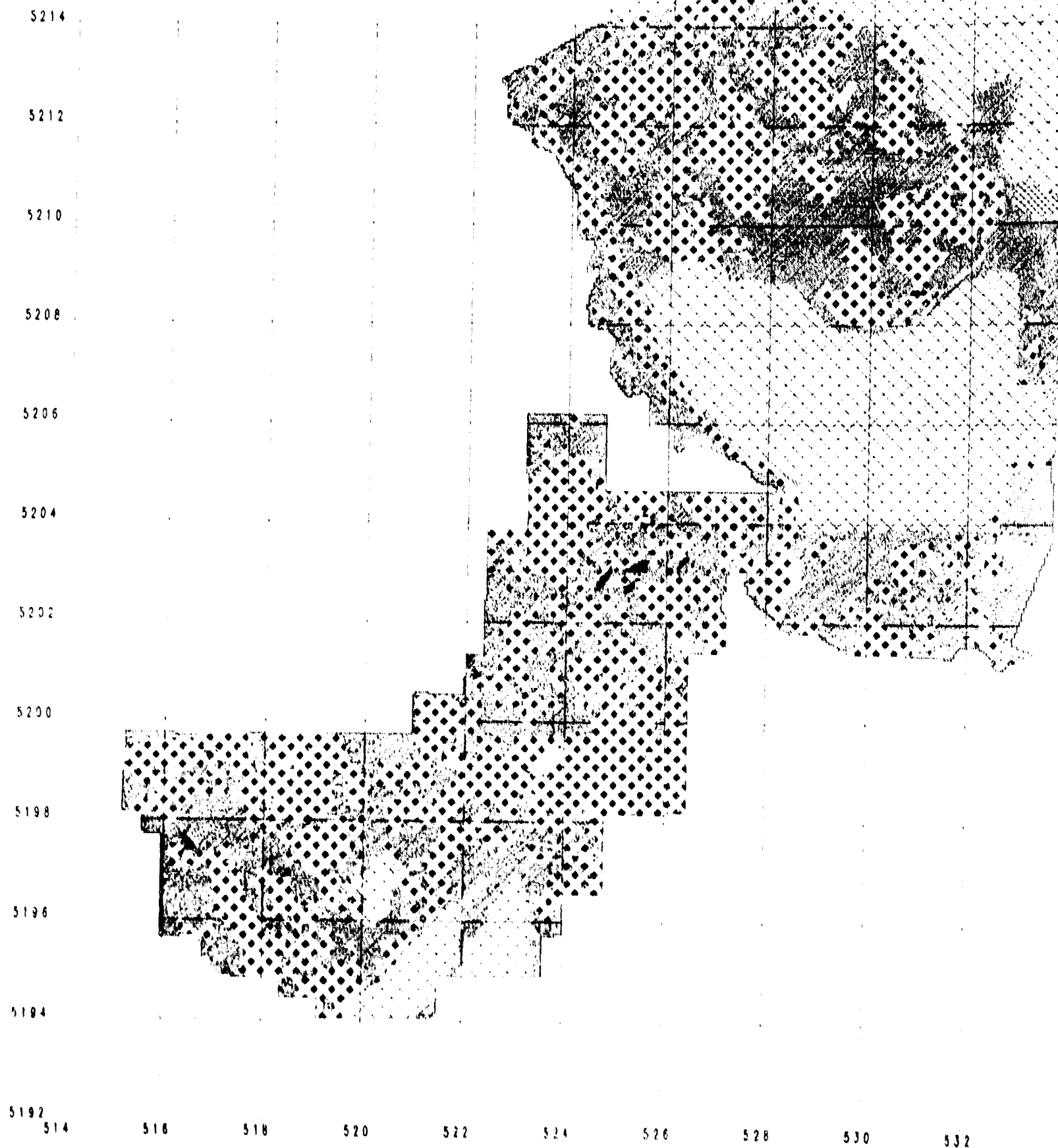
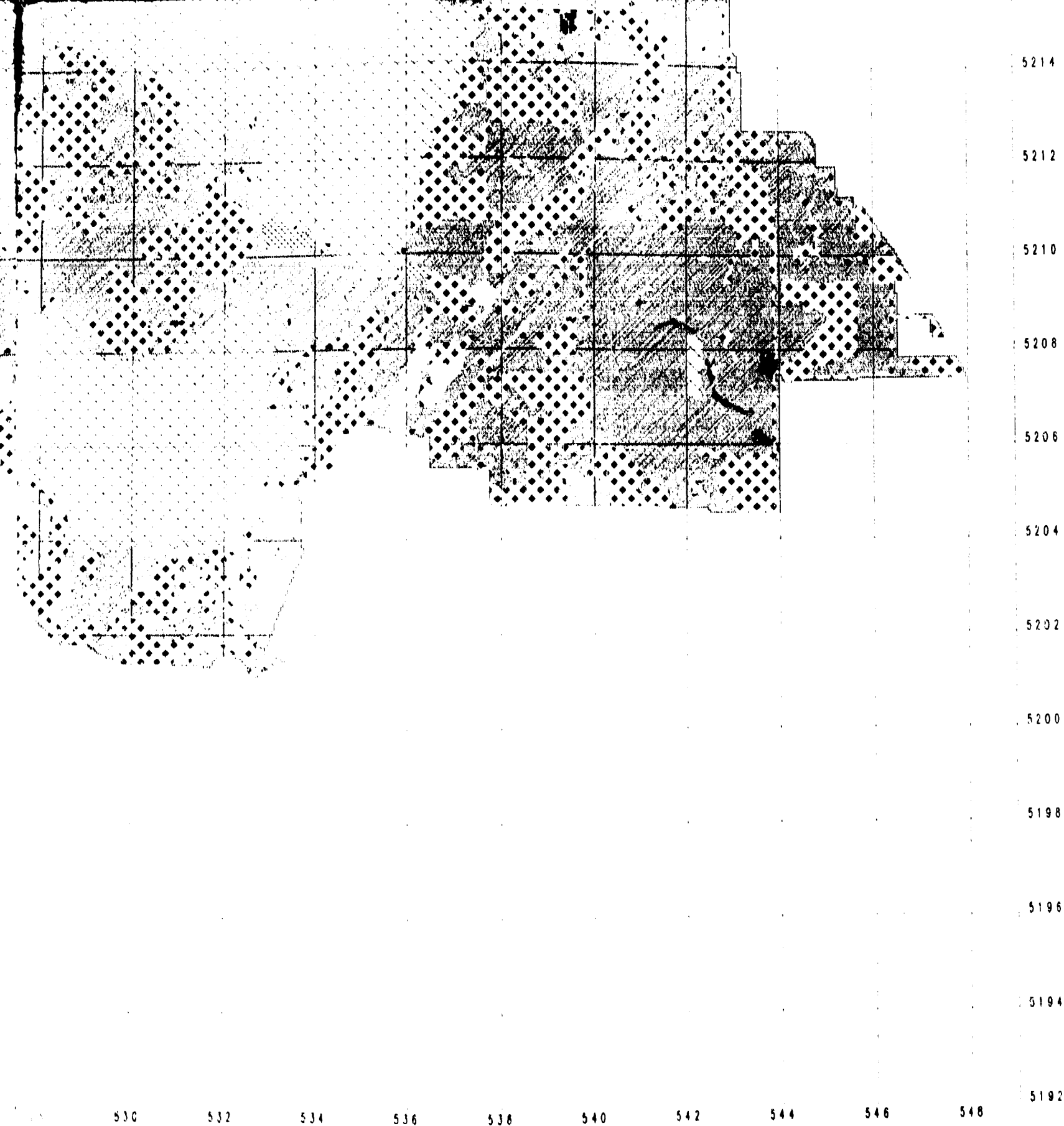
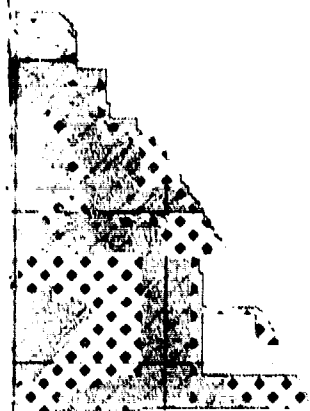


Plate 30. 'Ten pass soil' disturbance 1



mass soil disturbance level map for the 5-5-0 force structure in the wet slippery surface ce



5214

5212

5210

5208

5206

5204

5202

5200

5198

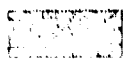
5196

5194

5192



SLIGHT
(5-15%)



MODERATE
(15-50%)



URBAN
OFF LIMITS

WATER

FT LEWIS, WASHINGTON
5-5-0 FORCE STRUCTURE
WET SEASON
SLIPPERY CONDITION
10 PASSES



METERS



N

546

548

the wet slippery surface condition

5224⁵¹⁴

516

518

520

522

524

526

528

530

532

5

5222

5220

5218

5216

5214

5212

5210

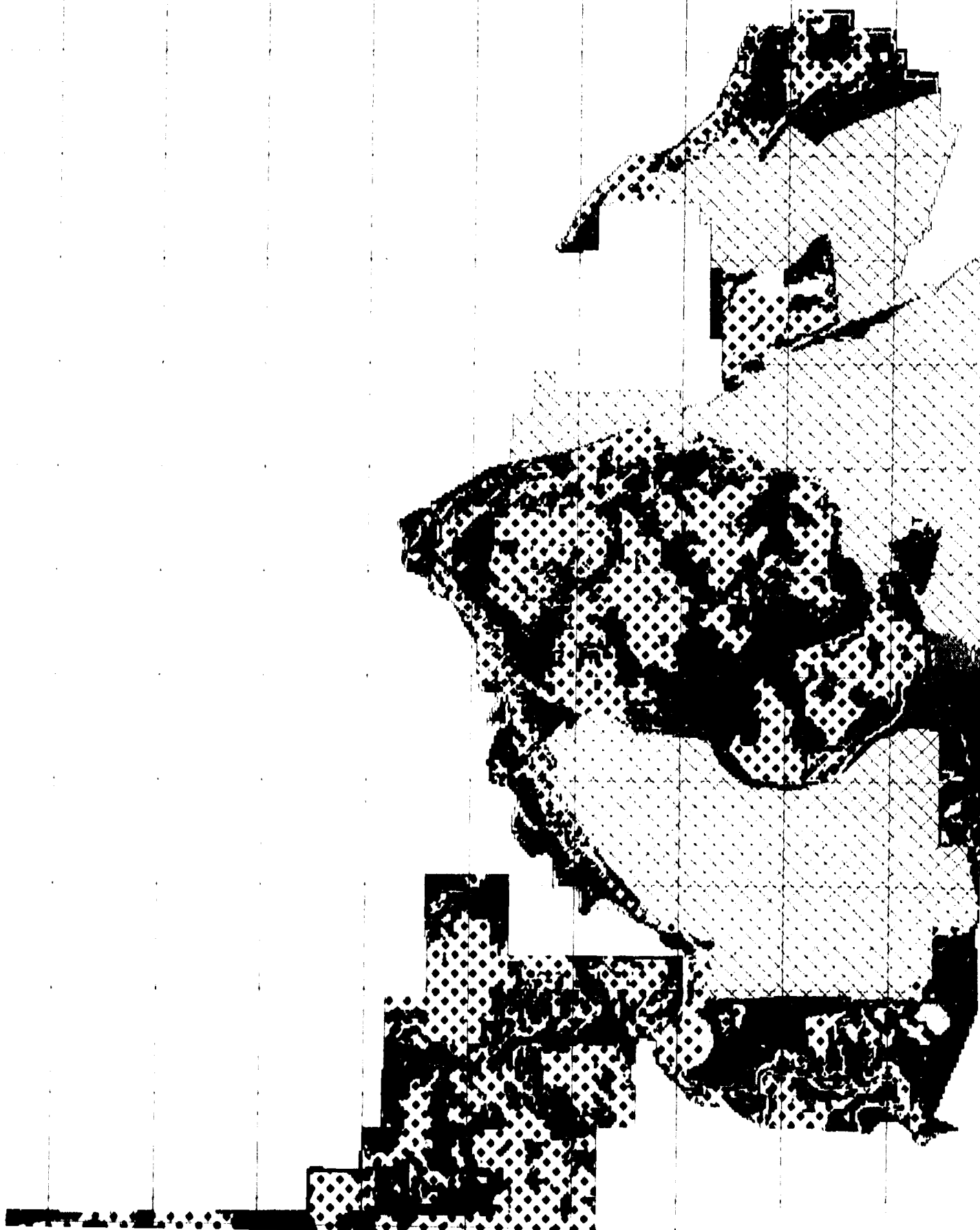
5208

5206

5204

5202

5200



528

530

532

534

536

538

540

542

544

546

548



546

548

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL DISTURBANCE LEVELS

SCALE 1:100000



NOGO



HIGH
(>5-12 in)



MINIMUM
(0-.5 in)



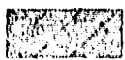
SEVERE
(>12 in)



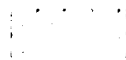
SLIGHT
(>.5-2 in)



URBAN/
OFF LIMITS



MODERATE
(>2-5 in)



WATER

FT LEWIS, WASHINGTON

5-5-0 FORCE STRUCTURE

WET SEASON

SLIPPERY CONDITION

50 PASSES

5214

5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

5194

5192

514

516

518

520

522

524

526

528

530



plate 31. Fifty pass soil

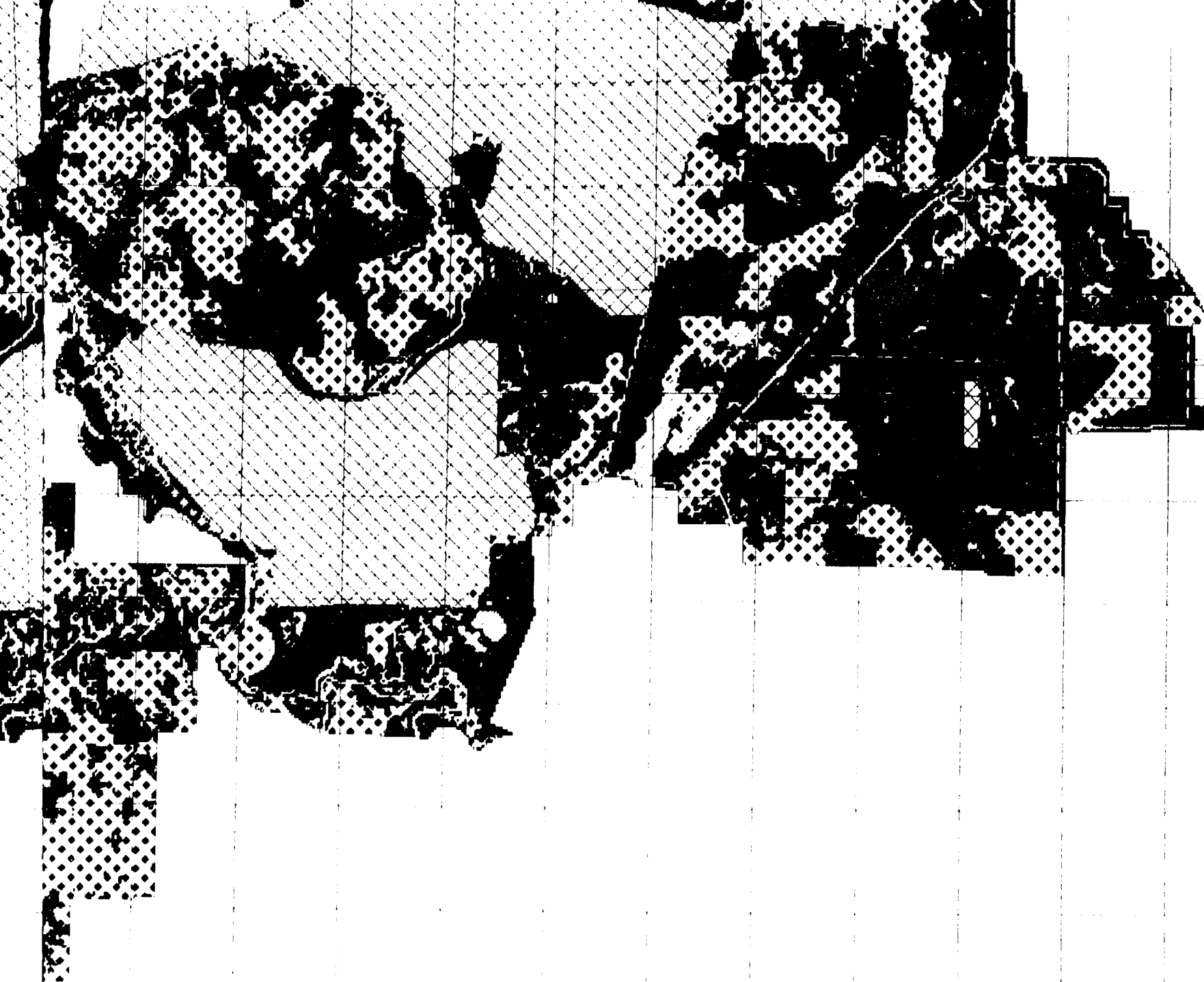
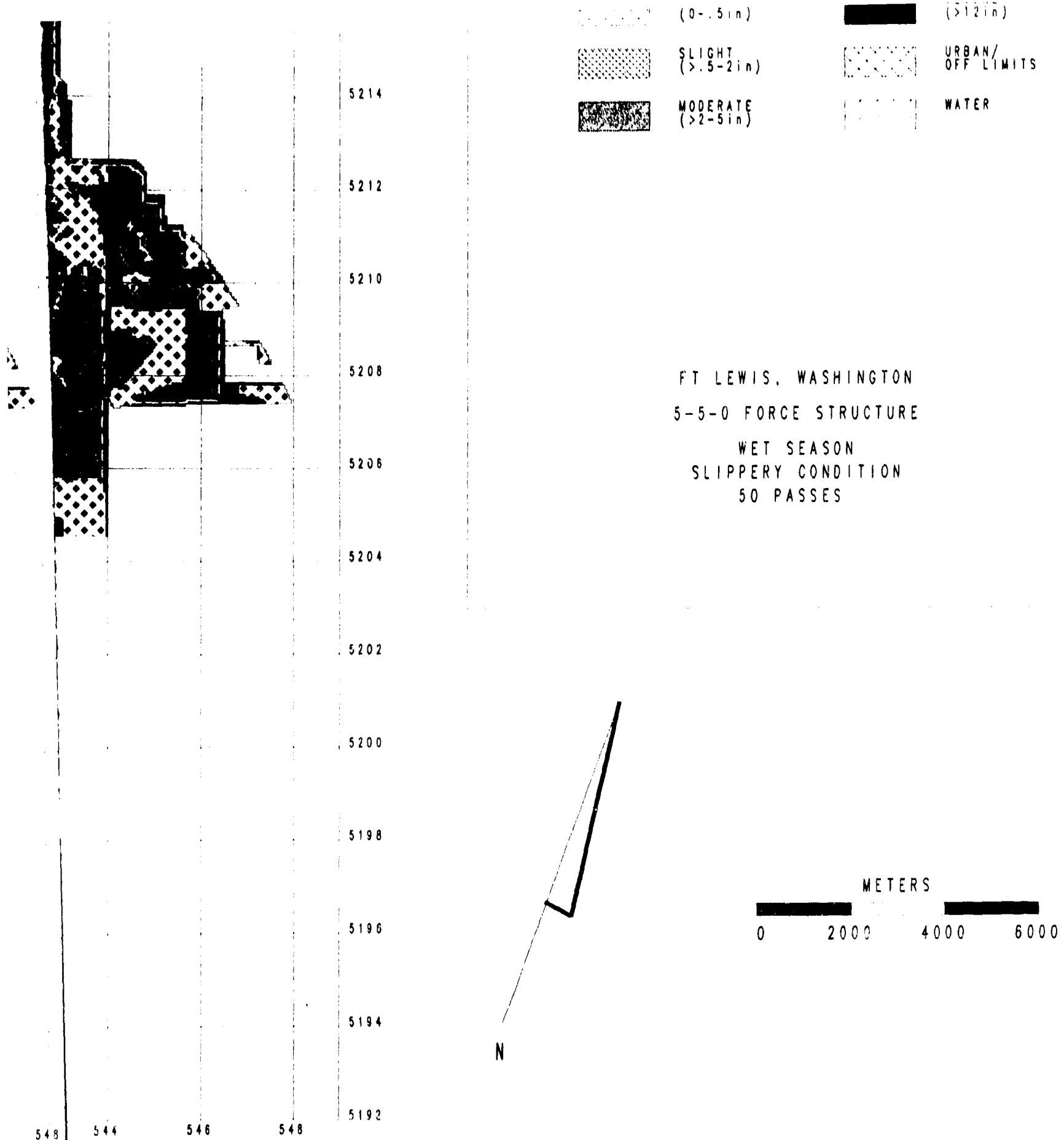


Figure 31. Fifty pass soil disturbance level map for the 5-5-0 force structure in the wet



ipper in the wet slippery surface condition

5224 514 516 518 520 522 524 526 528 530 532

5222

5220

5218

5216

5214

5212

5210

5208

5208

5204

5202

5200

5198



526

528

530

532

534

536

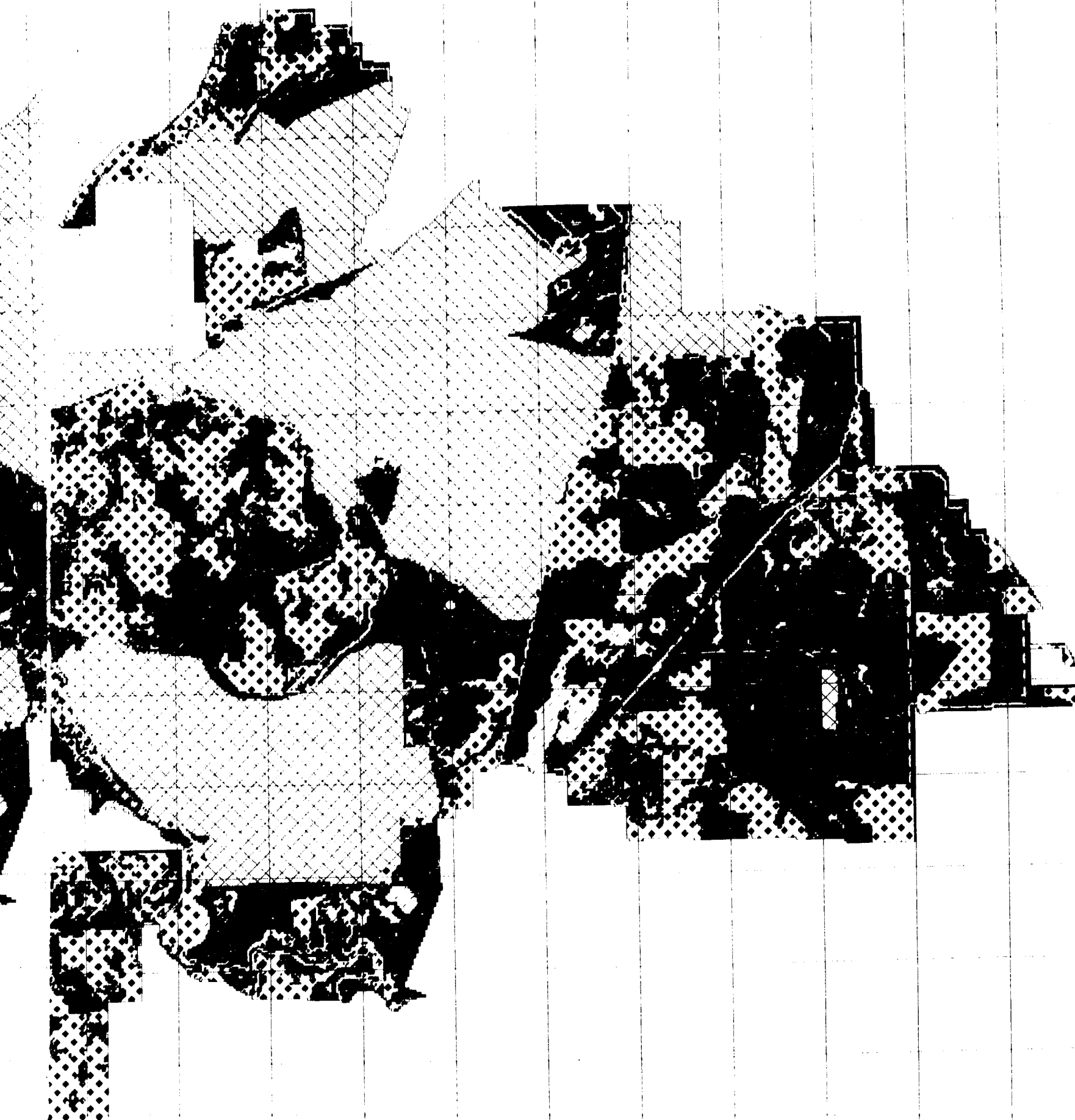
538

540

542

544

546



546

548

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL DISTURBANCE LEVELS

SCALE 1:100000



NOGO



HIGH
(>5-12 in)



MINIMUM
(0-.5 in)



SEVERE
(>12 in)



SLIGHT
(>.5-2 in)



URBAN/
OFF LIMITS



MODERATE
(>2-5 in)



WATER

FT LEWIS, WASHINGTON

5-5-0 FORCE STRUCTURE

WET SEASON

SLIPPERY CONDITION

1000 PASSES

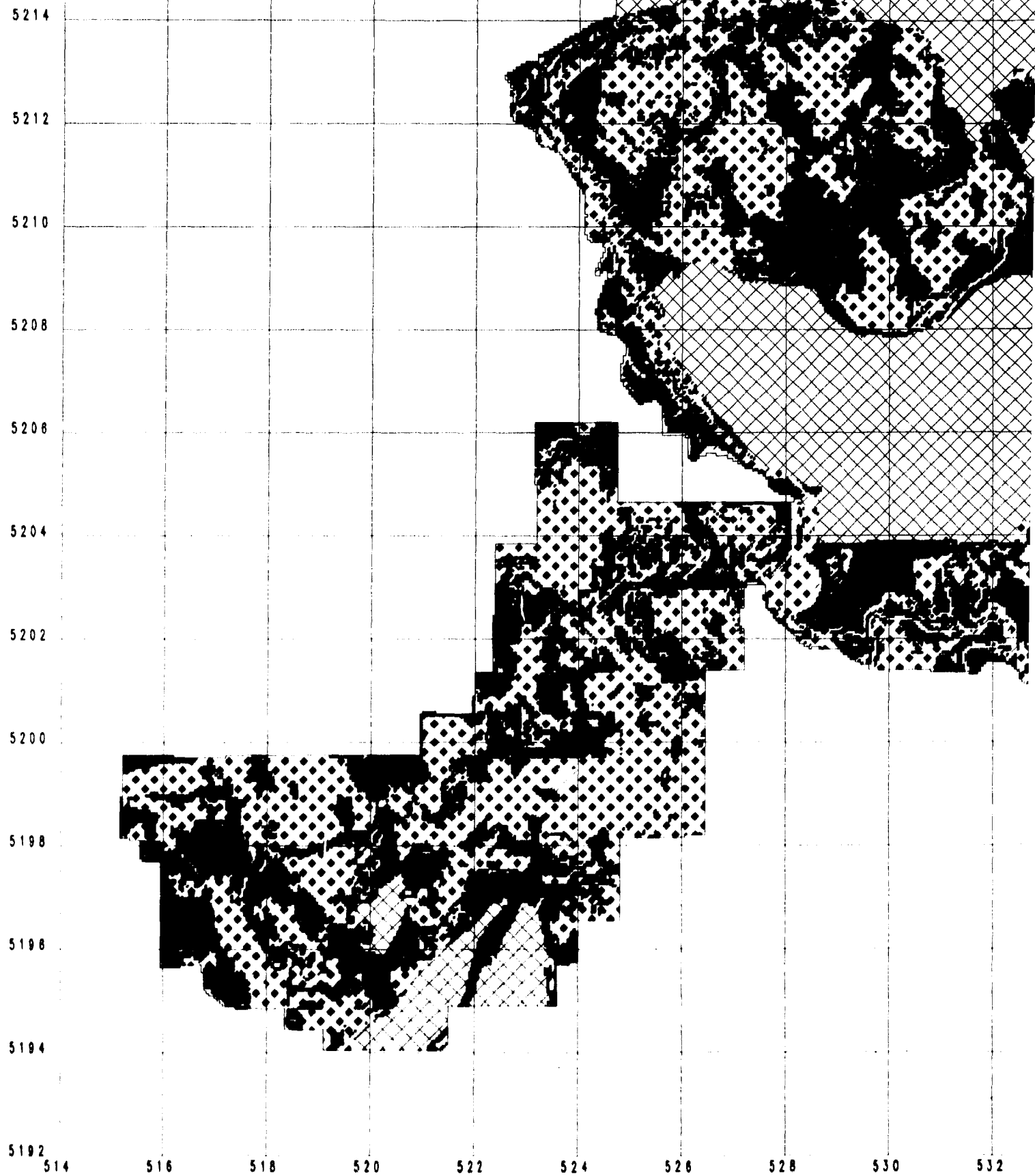
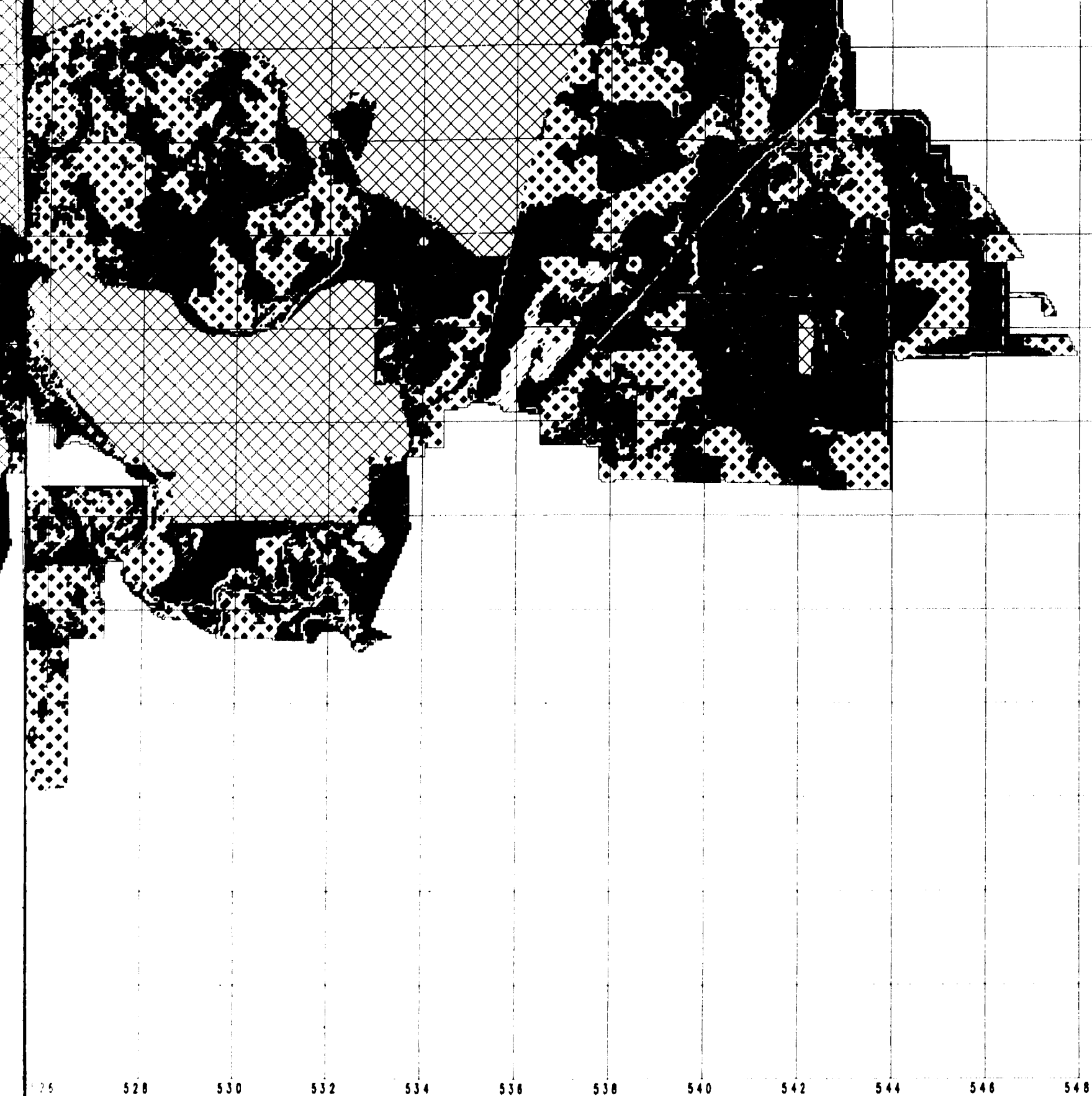
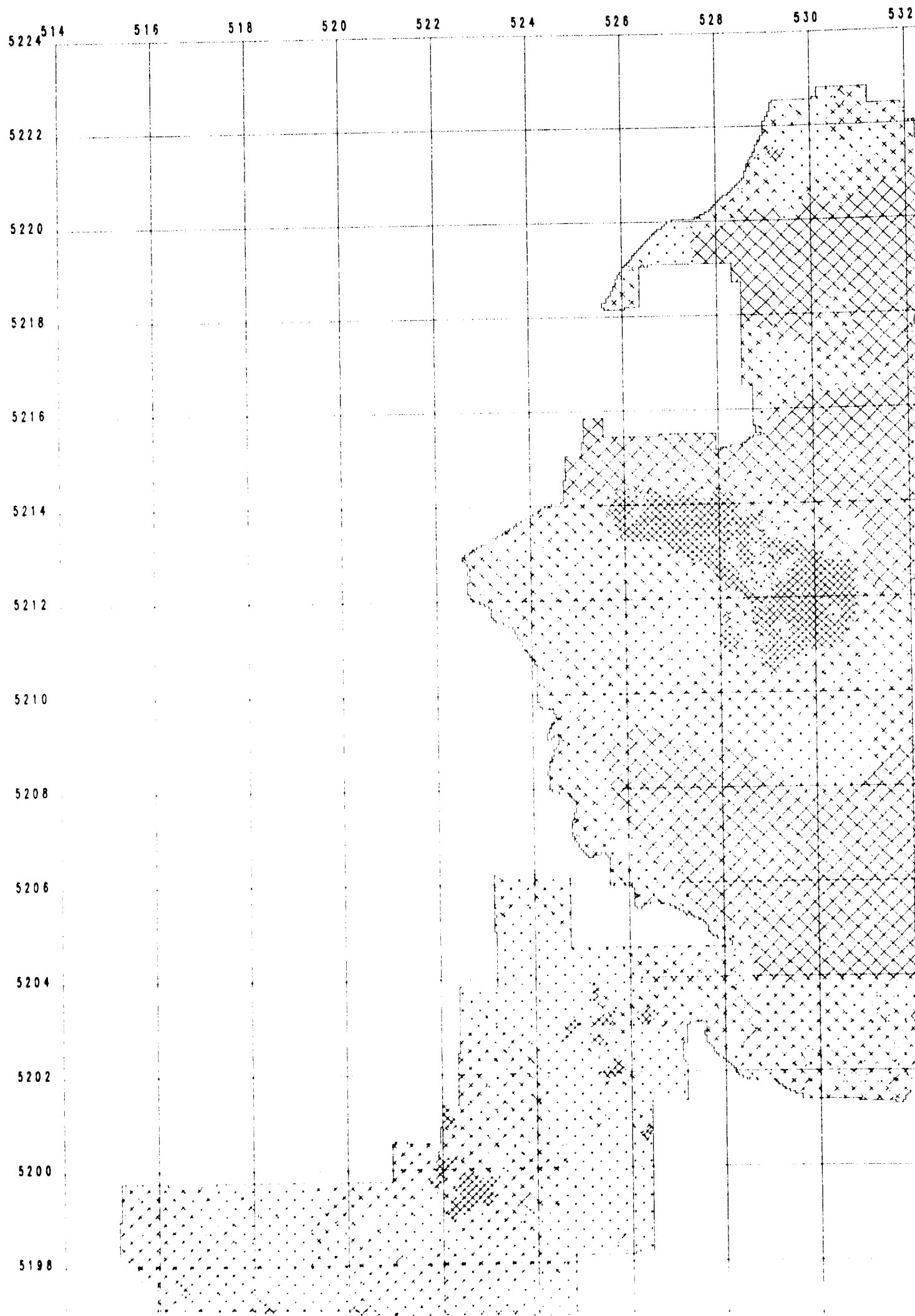


Plate 32. One thousand pass soil dist



One thousand pass soil disturbance level map for the 5-5-0 force structure in the wet



528

530

532

534

536

538

540

542

544

546

548

5

5

5

5

5

5

5

5

5

5

5

5

5

5



546

548

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

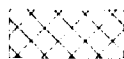
5200

5198



U. S. Army Corps of Engineers
Waterways
Experiment
Station

RATE OF SOIL EROSION
(TONS/ACRE/YEAR)
SCALE 1:100000



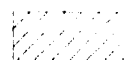
URBAN/
OFF LIMITS



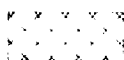
> 5 - 10



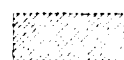
NO EROSION



> 10 - 20



> 0 - 1



> 20 - 30



> 1 - 5



> 30 - 40



> 40

FT. LEWIS, WASHINGTON

3-3-5 FORCE STRUCTURE
DRY SEASON
NORMAL CONDITION
10 PASSES

METERS

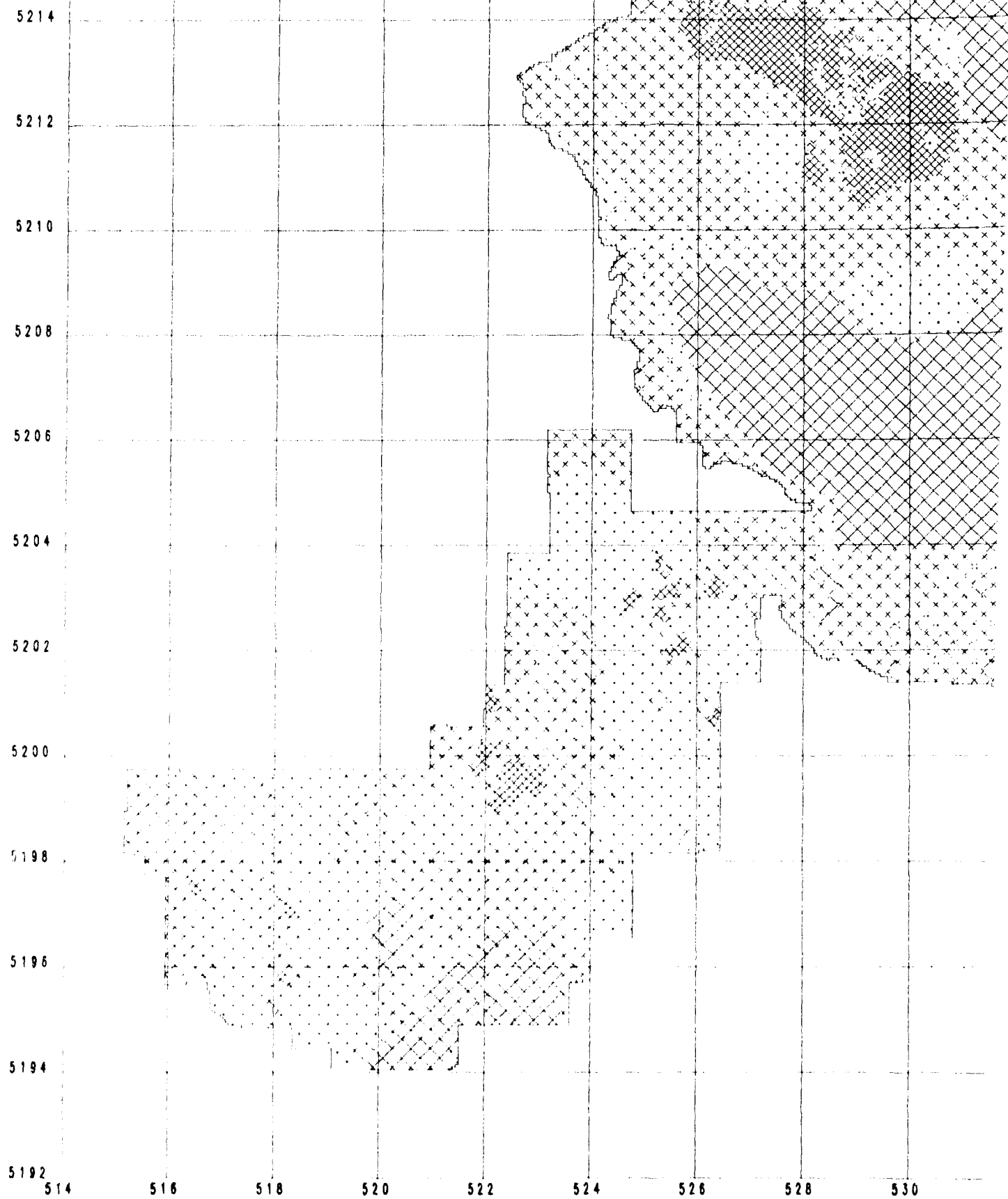
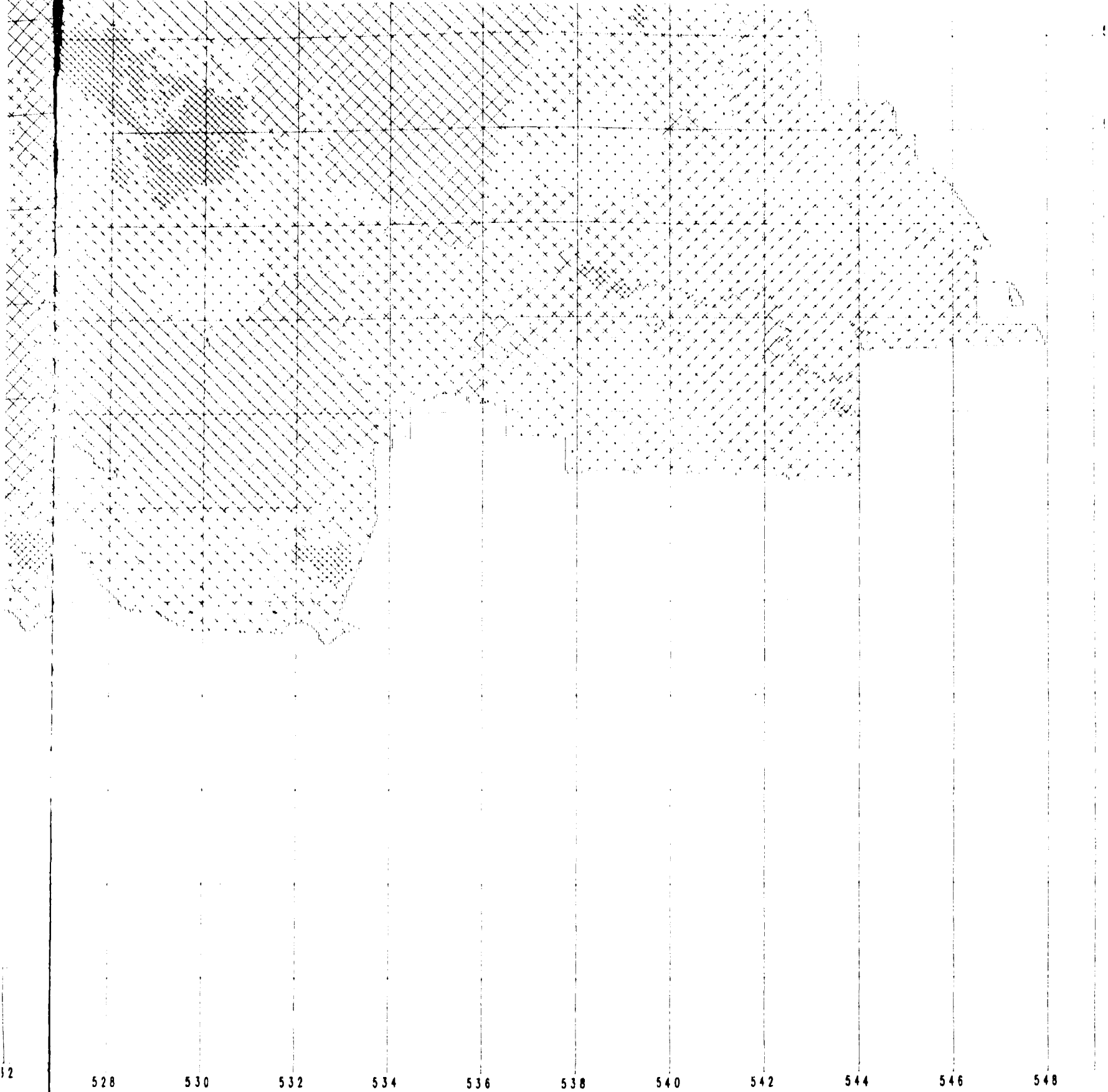
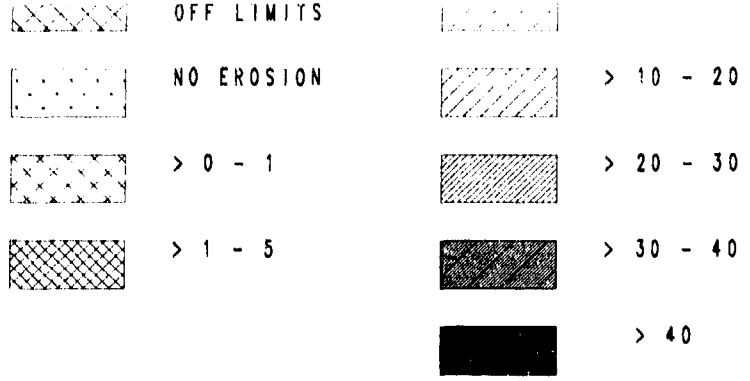
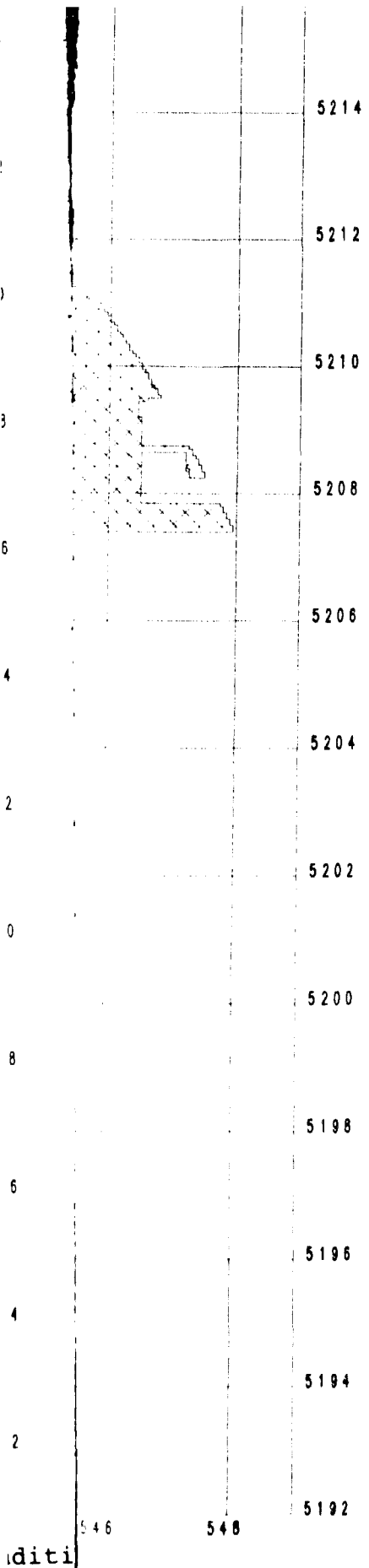


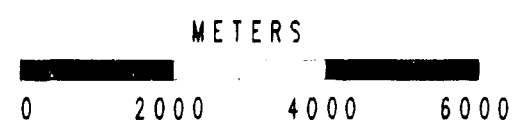
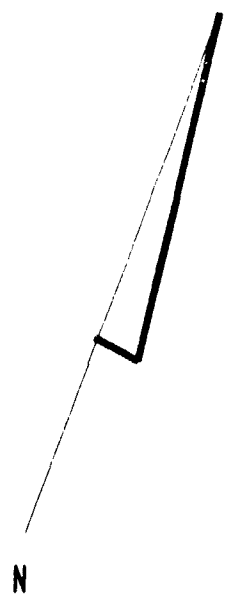
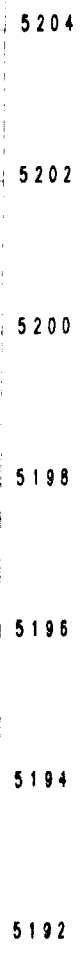
Plate 33. Rate of soil erosion f



3-3 of soil erosion for 3-3-5 and 4-3-3 (HMMWV) force structures in the dry normal surface

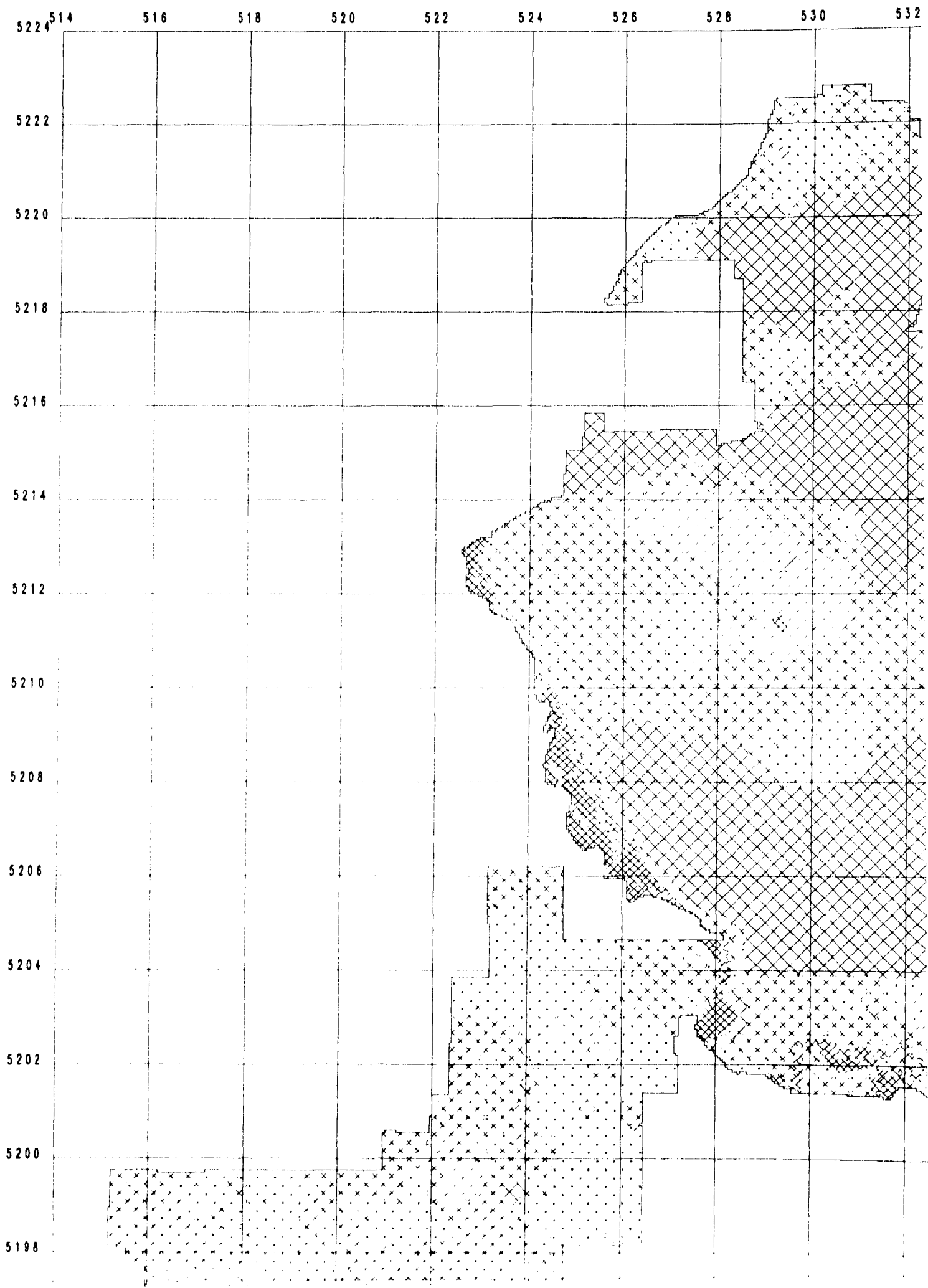


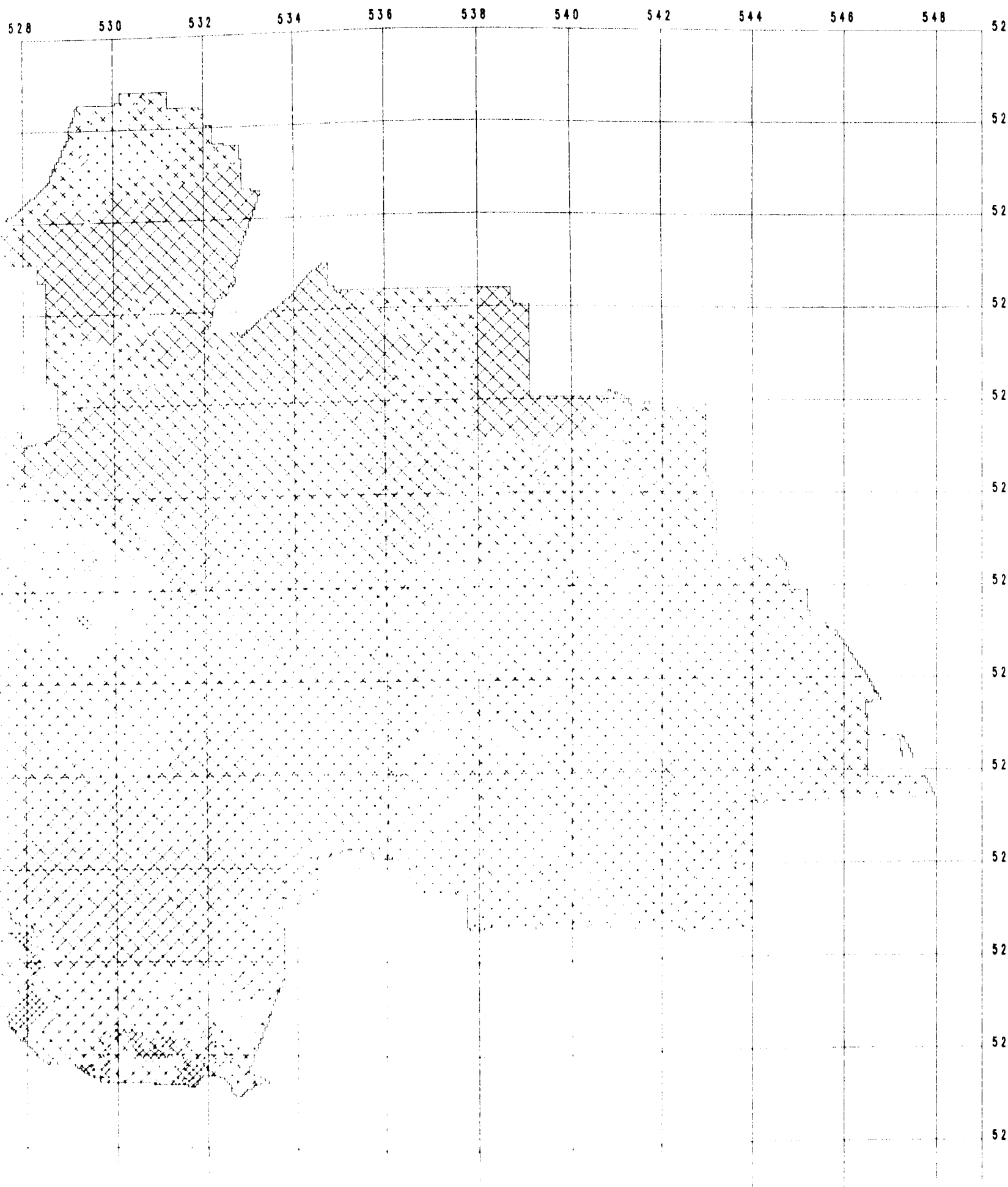
FT. LEWIS, WASHINGTON
 3-3-5 FORCE STRUCTURE
 DRY SEASON
 NORMAL CONDITION
 10 PASSES



aditi

rmal surface condition for ten passes





548

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200

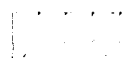


U. S. Army Corps of Engineers
Waterways
Experiment
Station

RATE OF SOIL EROSION
(TONS/ACRE/YEAR)
SCALE 1:100000



URBAN/
OFF LIMITS



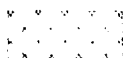
> 5 - 10



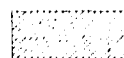
NO EROSION



> 10 - 20



> 0 - 1



> 20 - 30



> 1 - 5



> 30 - 40



> 40

FT. LEWIS, WASHINGTON

3-3-5 FORCE STRUCTURE

DRY SEASON

NORMAL CONDITION

50 PASSES

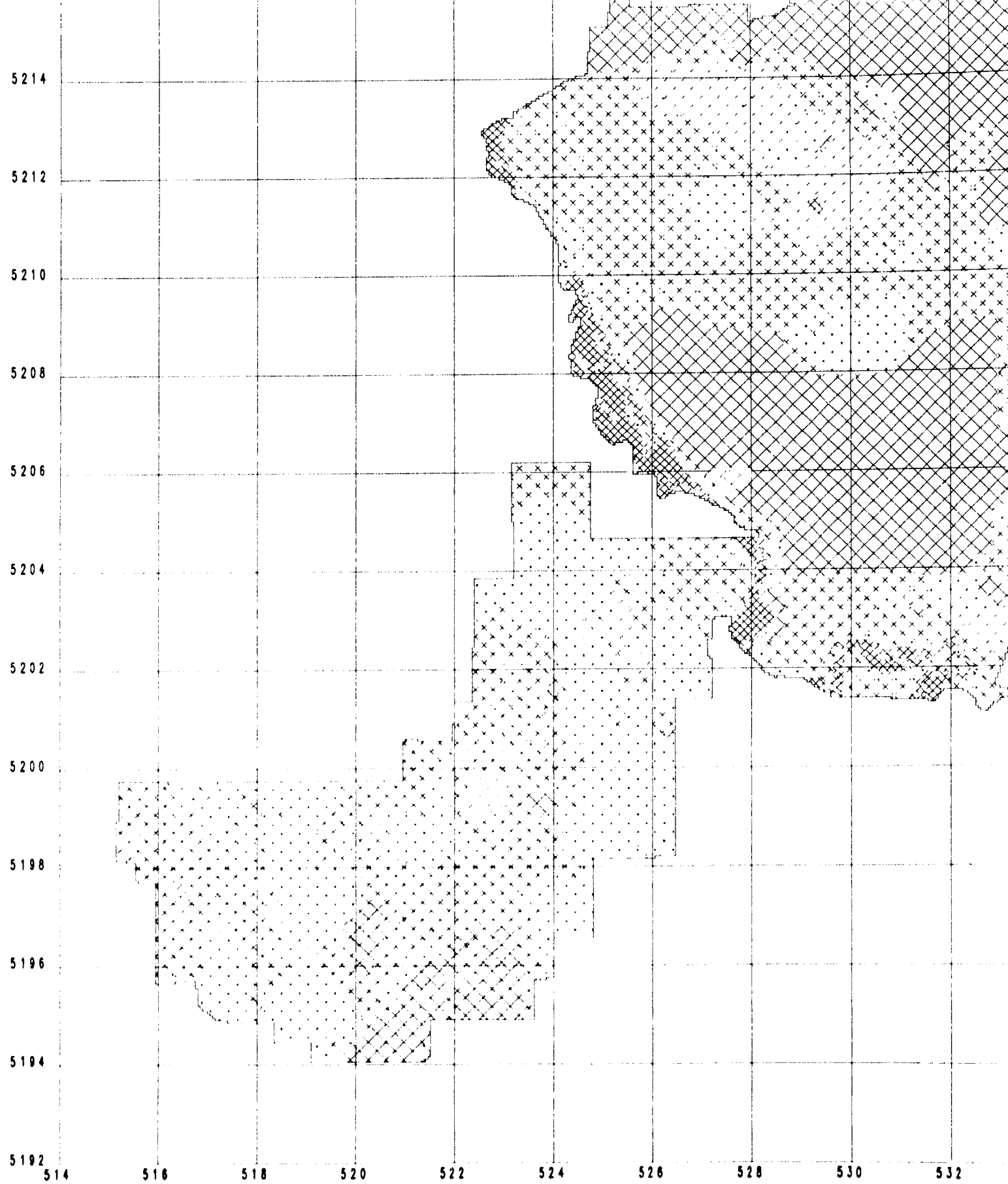
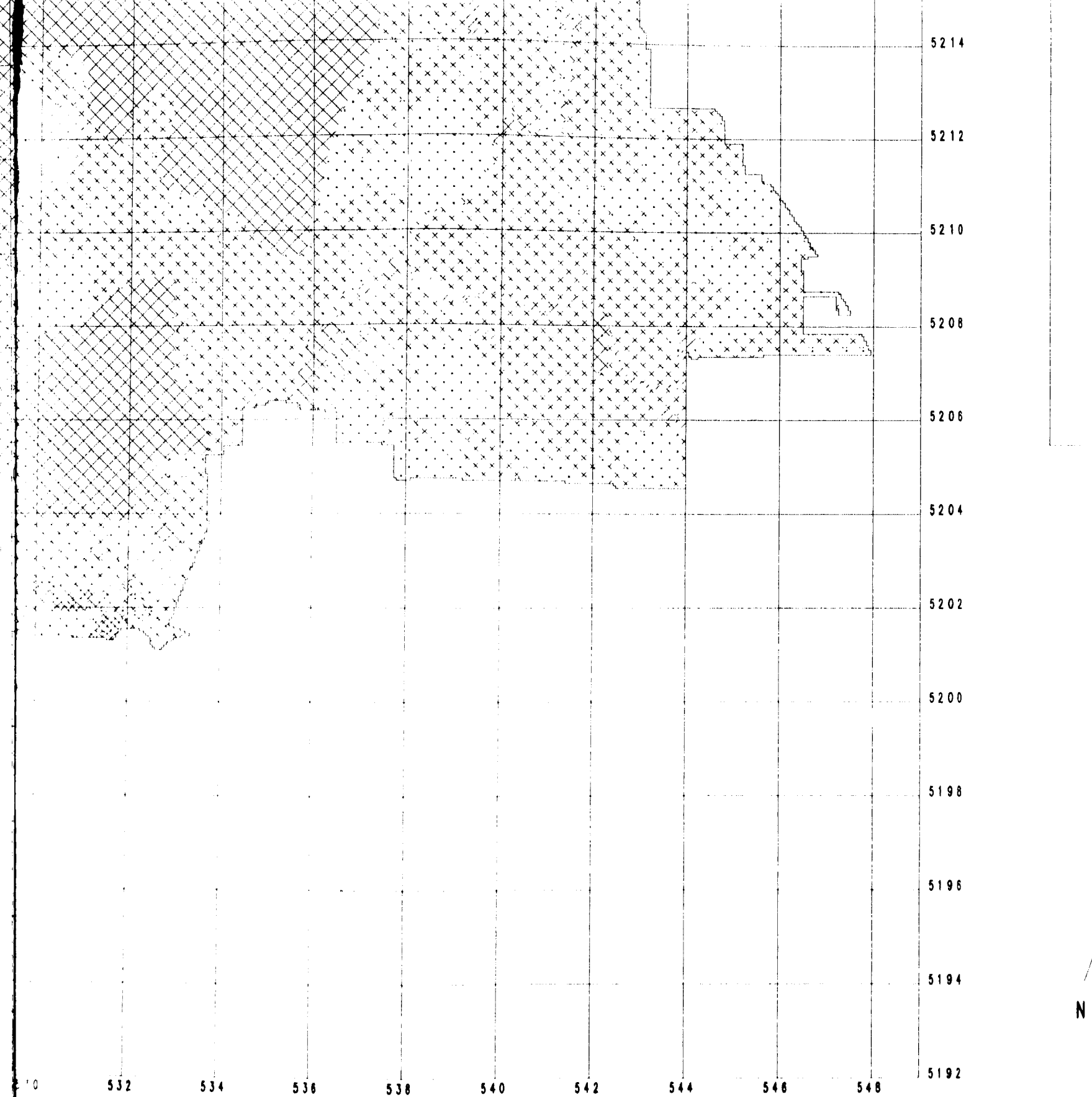
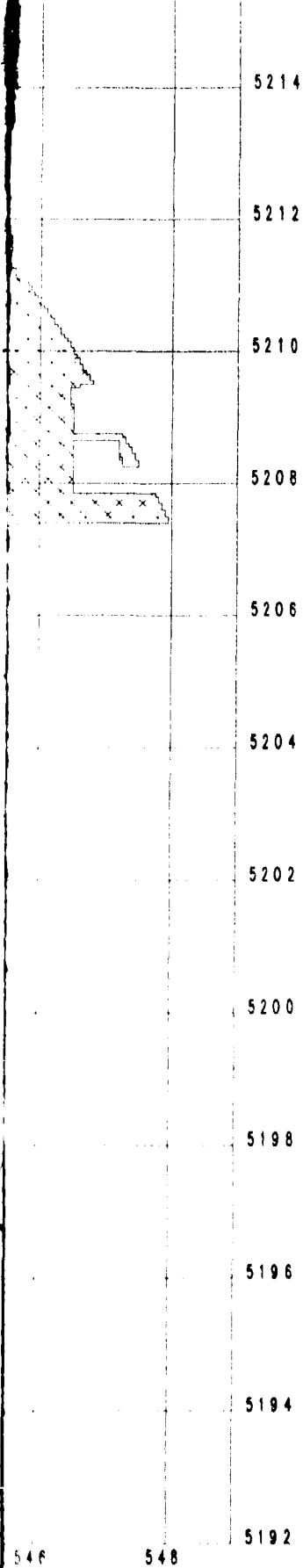


Plate 34. Rate of soil erosion for 3-3-5 and



for 3-3-5 and 4-3-3 (HMMWV) force structures in the dry normal surface condition for fifty



NO EROSION

> 0 - 1

> 1 - 5



> 10 - 20

> 20 - 30

> 30 - 40

> 40

FT. LEWIS, WASHINGTON

3-3-5 FORCE STRUCTURE

DRY SEASON

NORMAL CONDITION

50 PASSES

5206

5204

5202

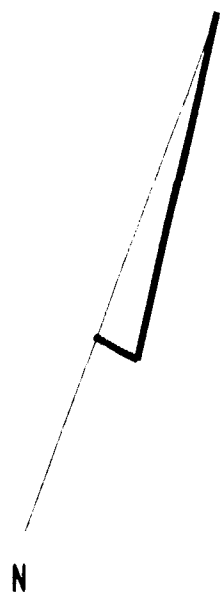
5200

5198

5196

5194

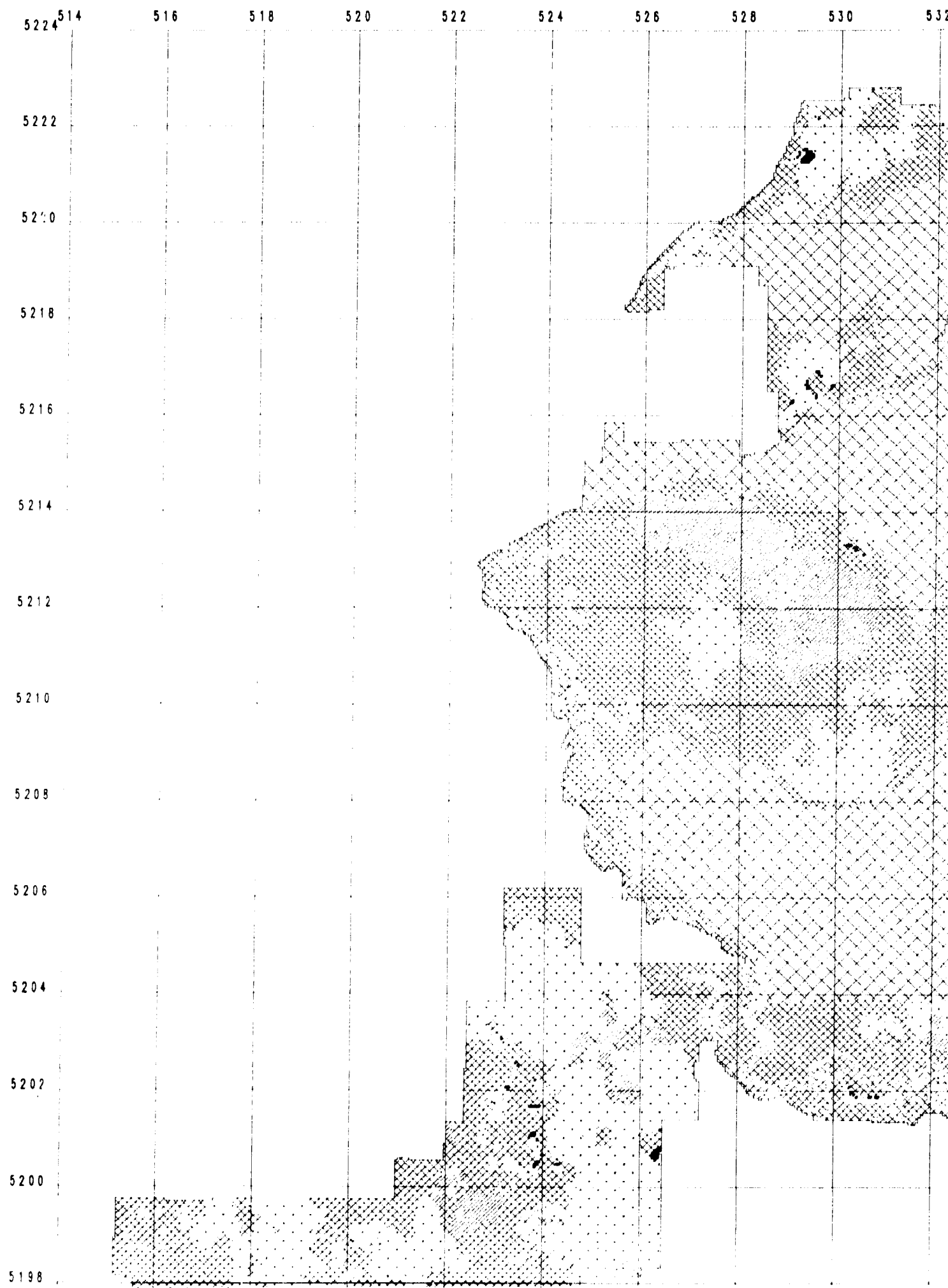
5192



METERS



surface condition for fifty passes



524

526

528

530

532

534

536

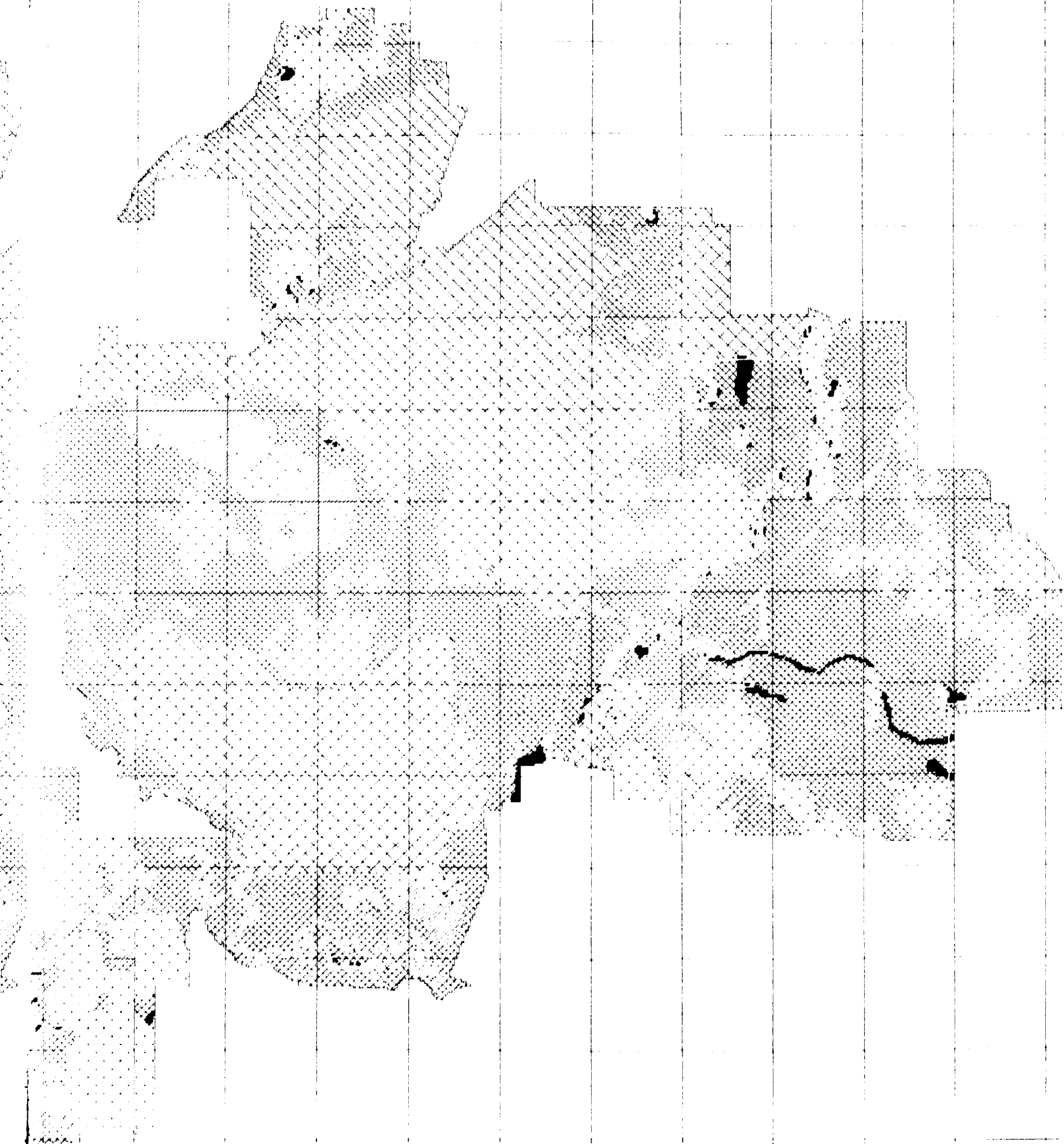
538

540

542

544

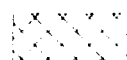
546





U. S. Army Corps of Engineers
Waterways
Experiment
Station

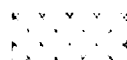
RATE OF SOIL EROSION
(TONS/ACRE/YEAR)
SCALE 1:100000



URBAN/
OFF LIMITS



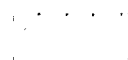
NO EROSION



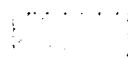
> 0 - 1



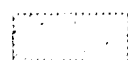
> 1 - 5



> 5 - 10



> 10 - 20



> 20 - 30



> 30 - 40



> 40

FT. LEWIS, WASHINGTON

3-3-5 FORCE STRUCTURE

DRY SEASON

NORMAL CONDITION

1000 PASSES

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200

546

548

544

5214
5212
5210
5208
5206
5204
5202
5200
5198
5196
5194
5192
514

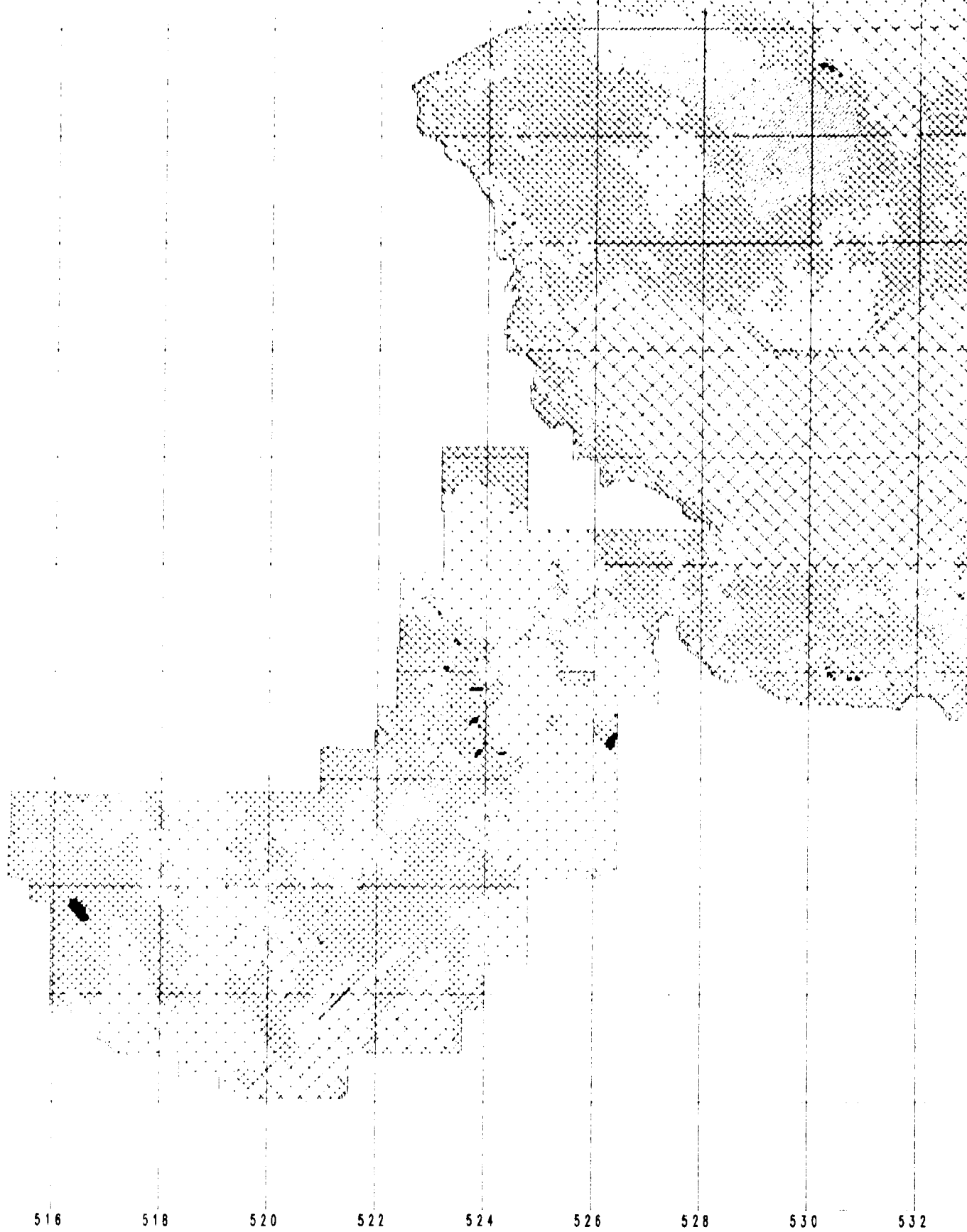
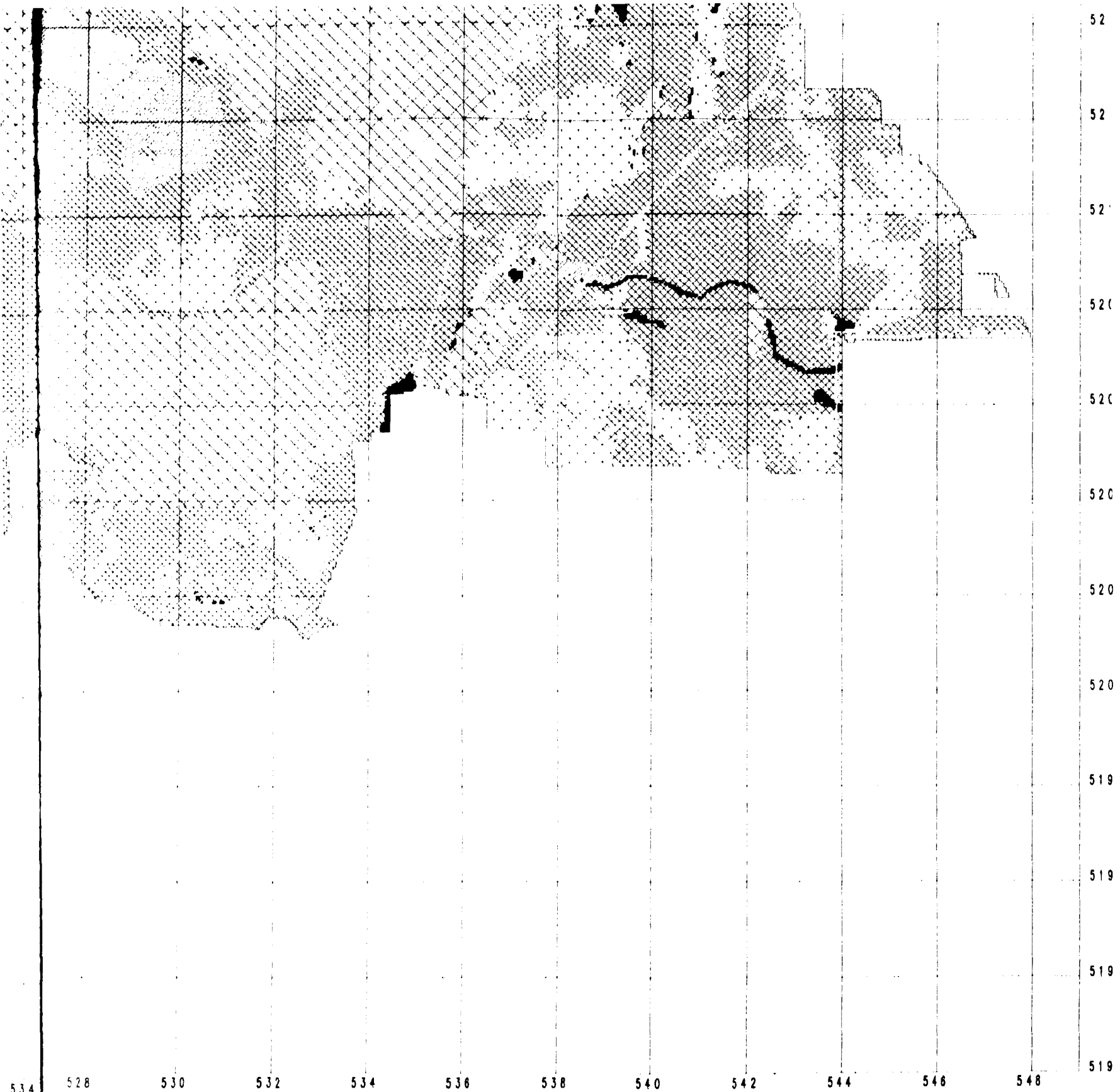


Plate 35. Rate of soil erosion for 3-3-5



id 4 soil erosion for 3-3-5 and 4-3-3 (HMMWV) force structures in the dry normal surface condi

5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

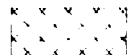
5194

5192

544

546

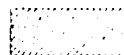
548



> 0 - 1



> 1 - 5



> 20 - 30



> 30 - 40



> 40

FT. LEWIS, WASHINGTON

3-3-5 FORCE STRUCTURE

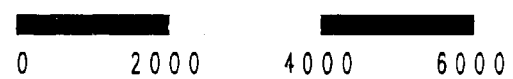
DRY SEASON

NORMAL CONDITION

1000 PASSES

N

METERS



ion the dry normal surface condition for one thousand passes

5224 514

516

518

520

522

524

526

528

530

53

5222

5220

5218

5216

5214

5212

5210

5208

5206

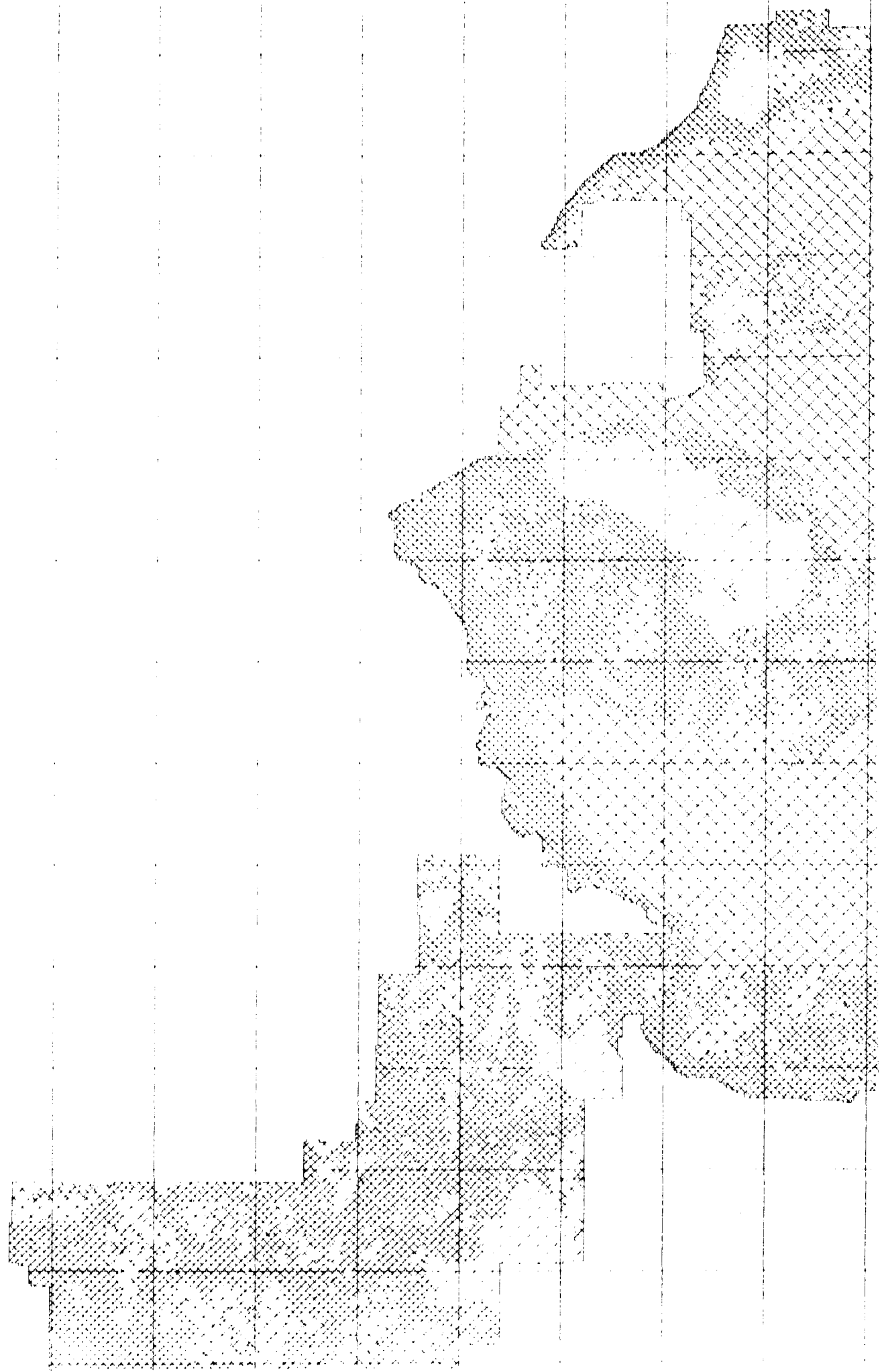
5204

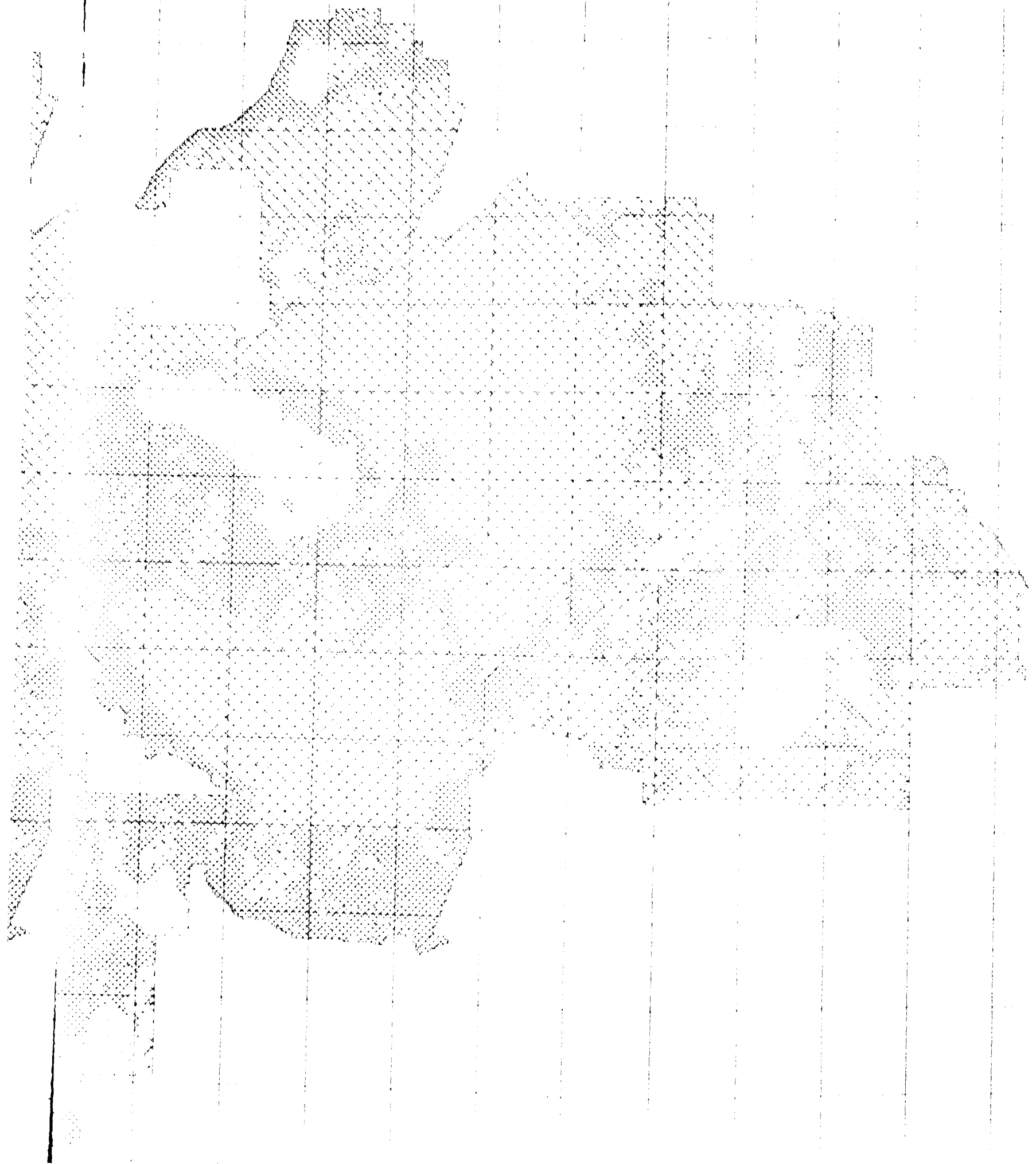
5202

5200

5198

5196







U. S. Army Corps of Engineers
Waterways
Experiment
Station

RATE OF SOIL EROSION
(TONS/ACRE/YEAR)
SCALE 1:100000



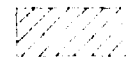
URBAN/
OFF LIMITS



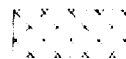
> 5 - 10



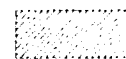
NO EROSION



> 10 - 20



> 0 - 1



> 20 - 30



> 1 - 5



> 30 - 40



> 40

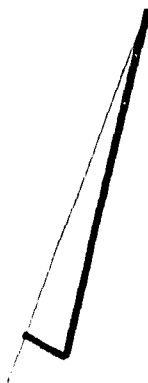
FT. LEWIS, WASHINGTON

3-3-5 FORCE STRUCTURE

WET SEASON

SLIPPERY CONDITION

10 PASSES



METERS



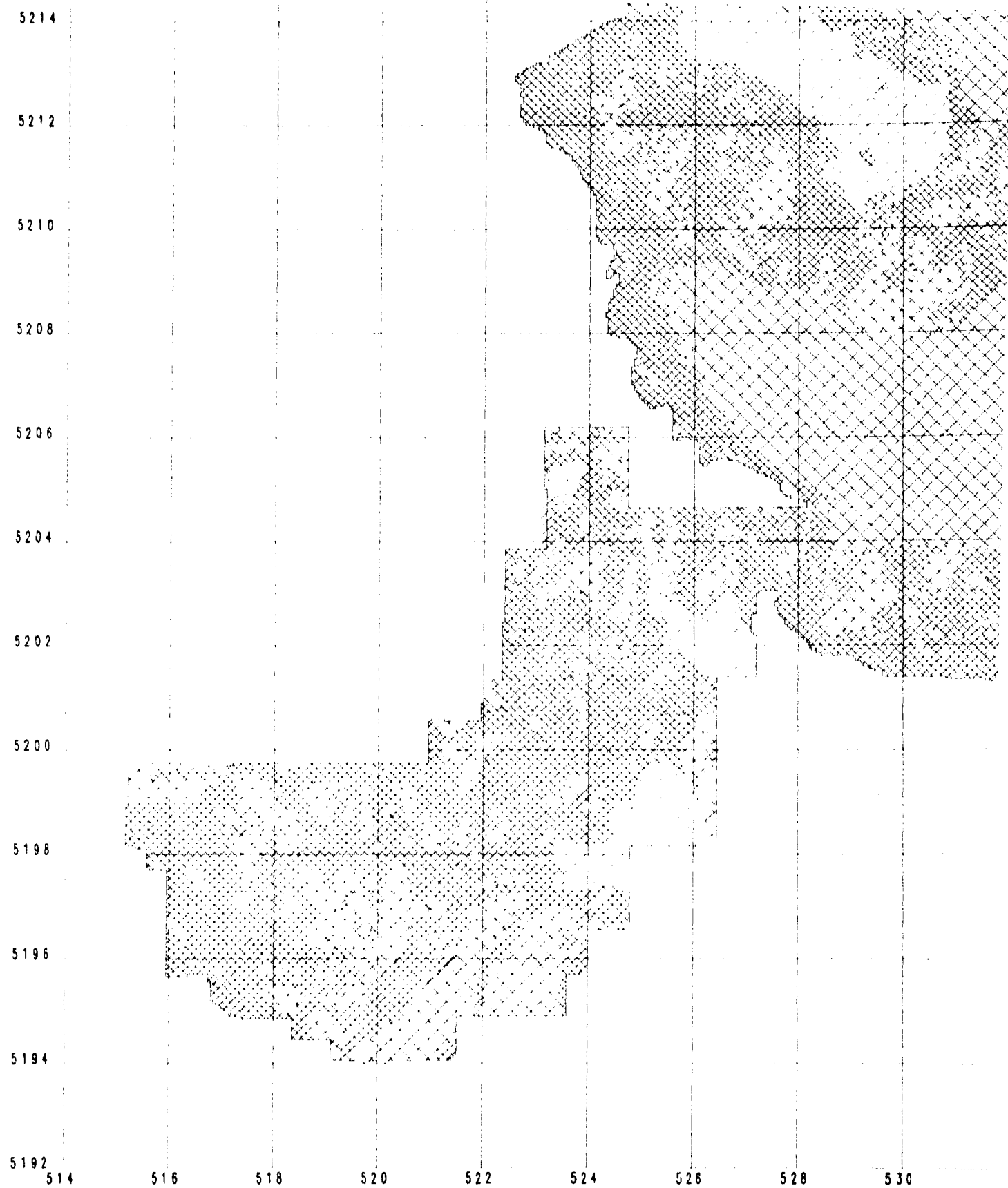
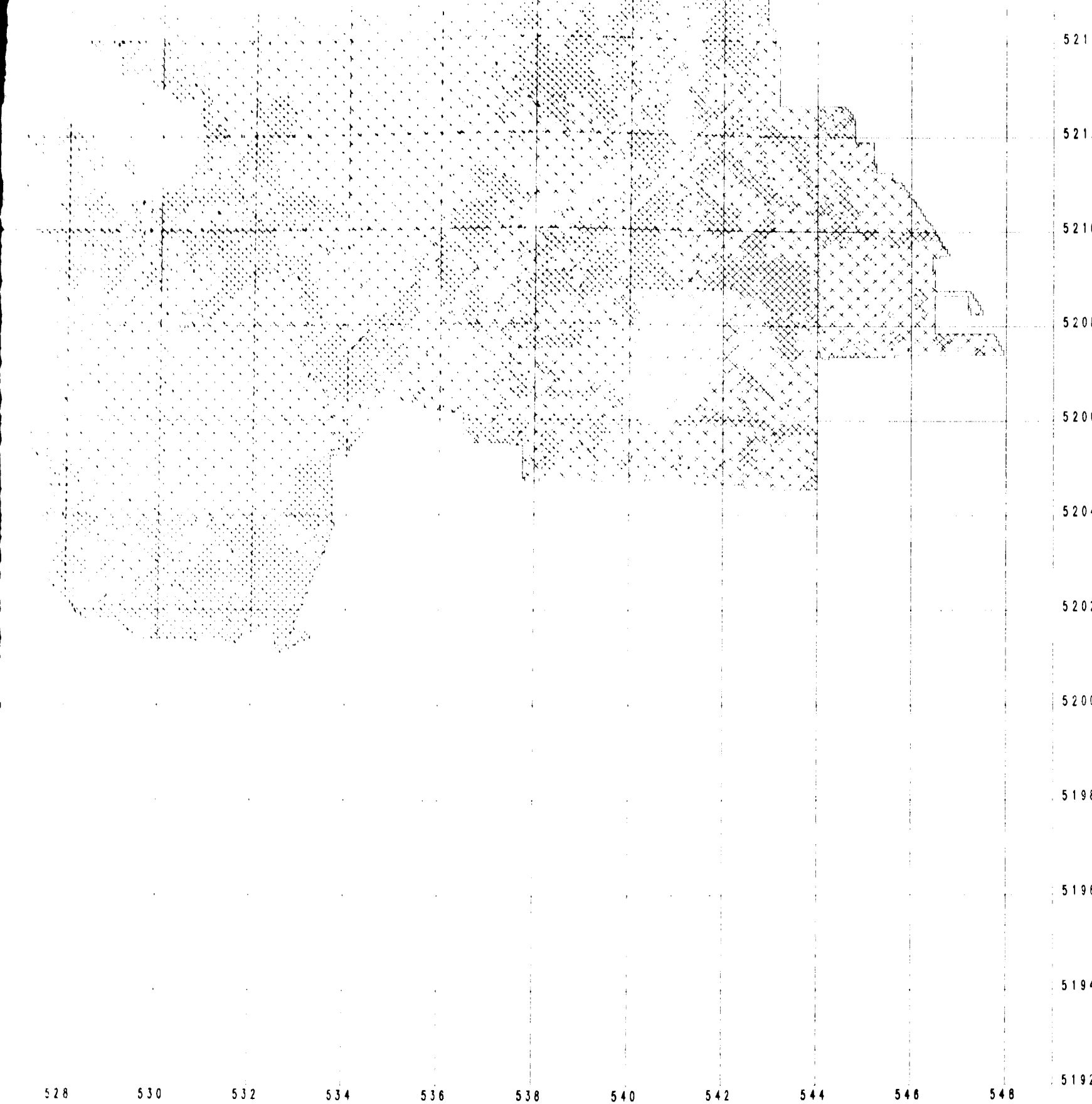
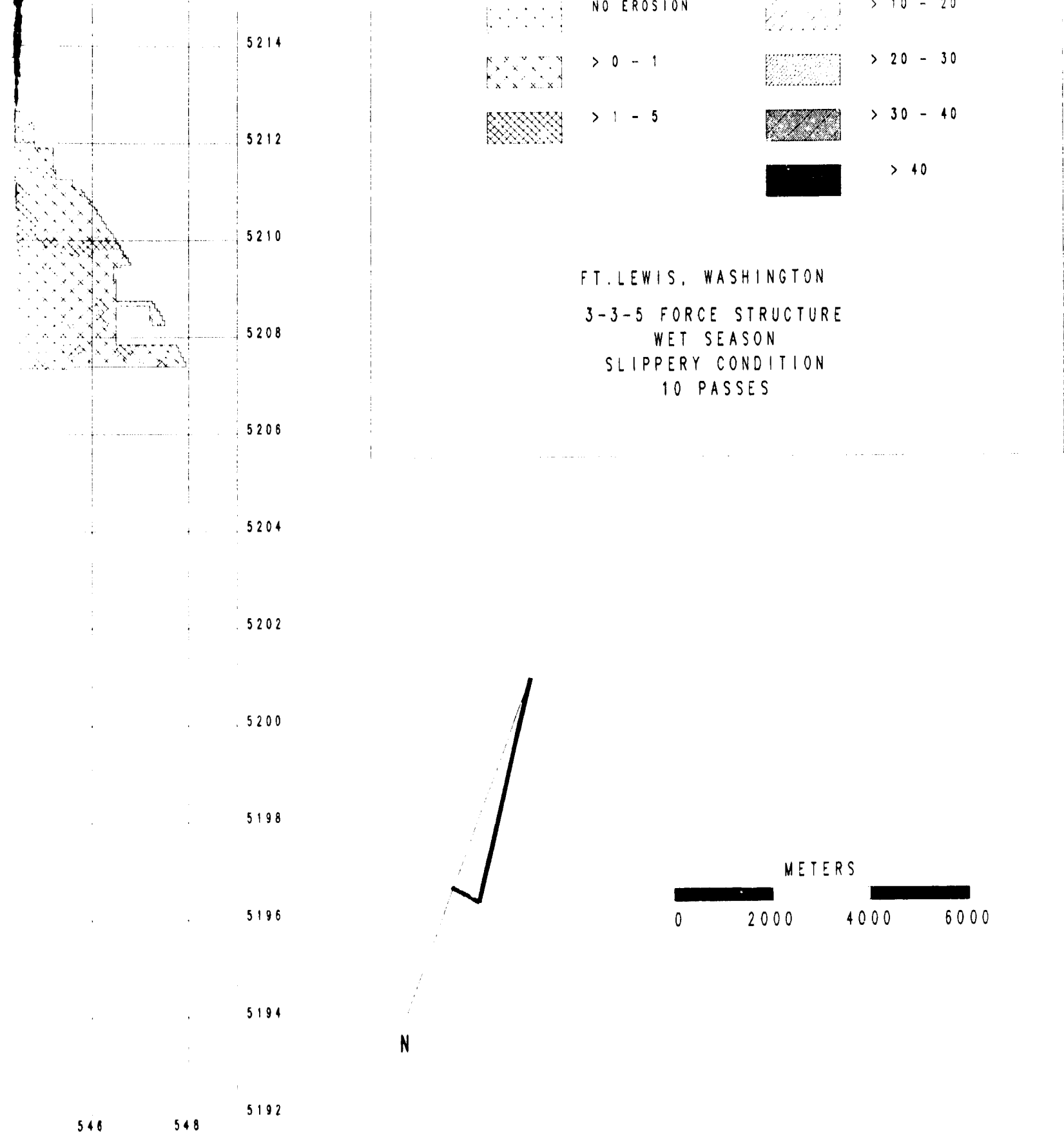


Plate 36. Rate of soil erosion for 3-3-



...al erosion for 3-3-5 and 4-3-3 (HMMWV) force structures in the wet slippery surface condition



slippery surface condition for ten passes

5224⁵¹⁴ 516 518 520 522 524 526 528 530 532

5222

5220

5218

5216

5214

5212

5210

5208

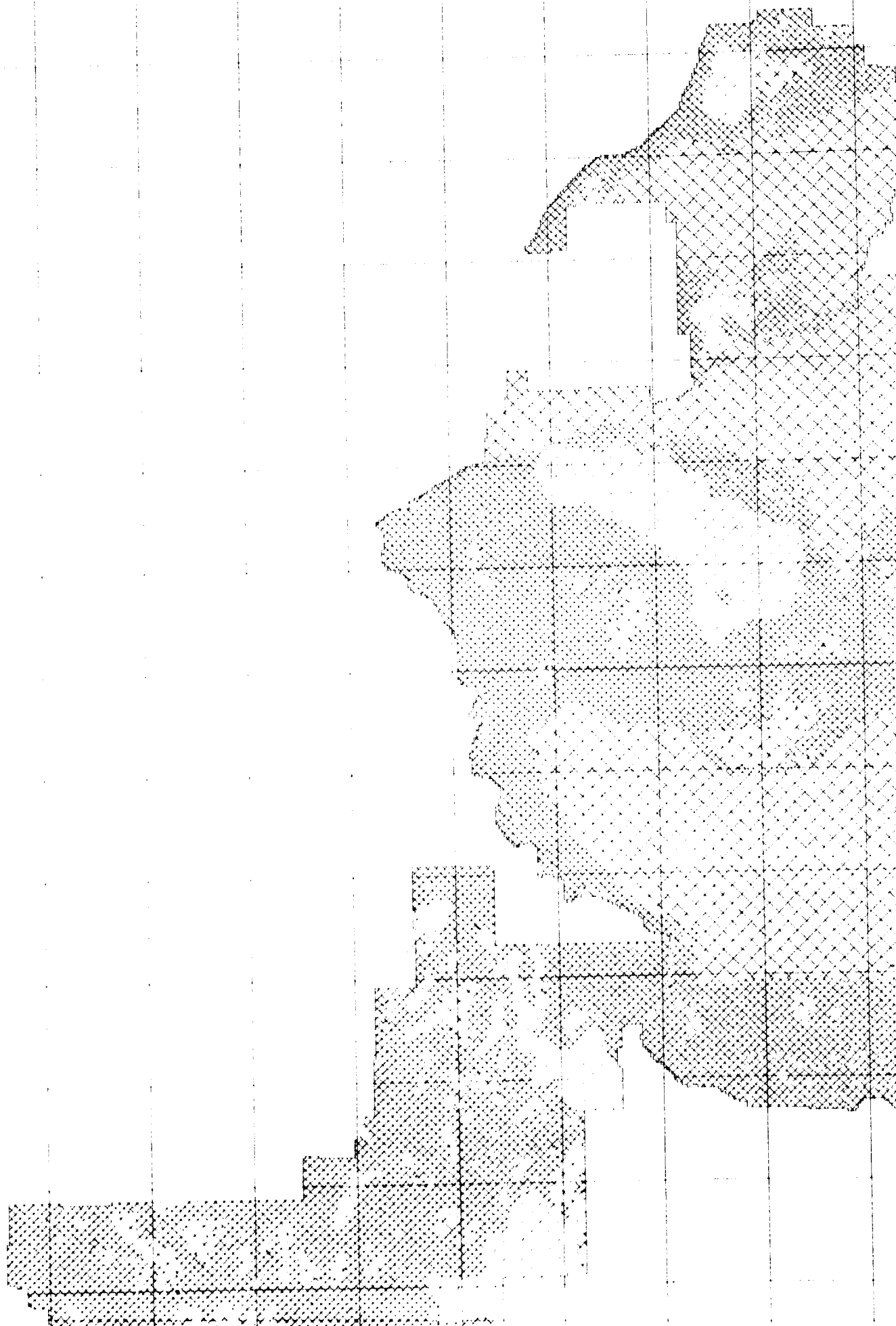
5206

5204

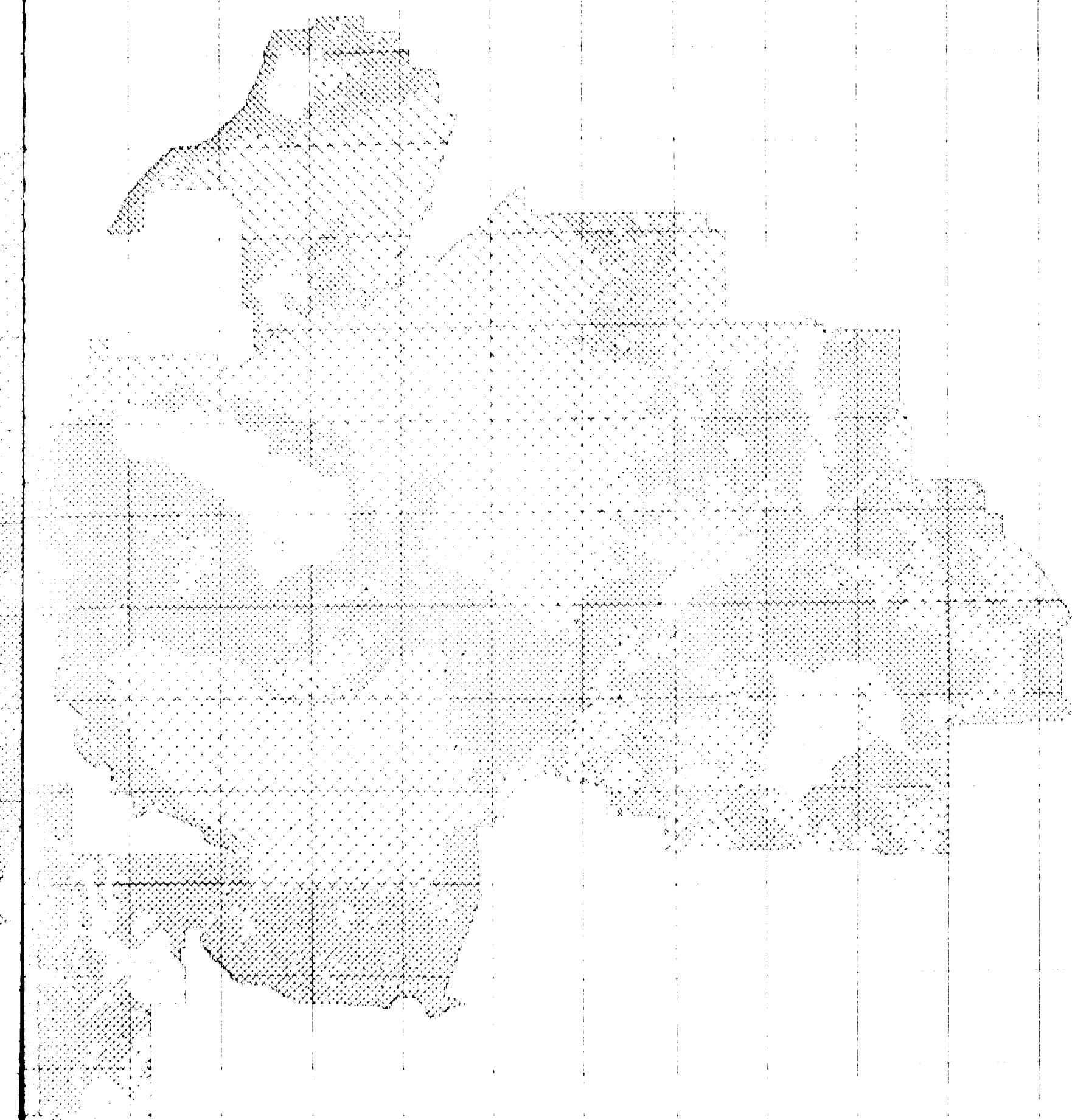
5202

5200

5198



524 526 528 530 532 534 536 538 540 542 544 546



5

544

546

548

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200

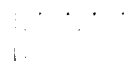


U. S. Army Corps of Engineers
Waterways
Experiment
Station

RATE OF SOIL EROSION
(TONS/ACRE/YEAR)
SCALE 1:100000



URBAN/
OFF LIMITS



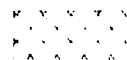
> 5 - 10



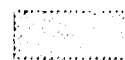
NO EROSION



> 10 - 20



> 0 - 1



> 20 - 30



> 1 - 5



> 30 - 40



> 40

FT. LEWIS, WASHINGTON

3-3-5 FORCE STRUCTURE
WET SEASON
SLIPPERY CONDITION
50 PASSES

5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

5194

5192
514

516

518

520

522

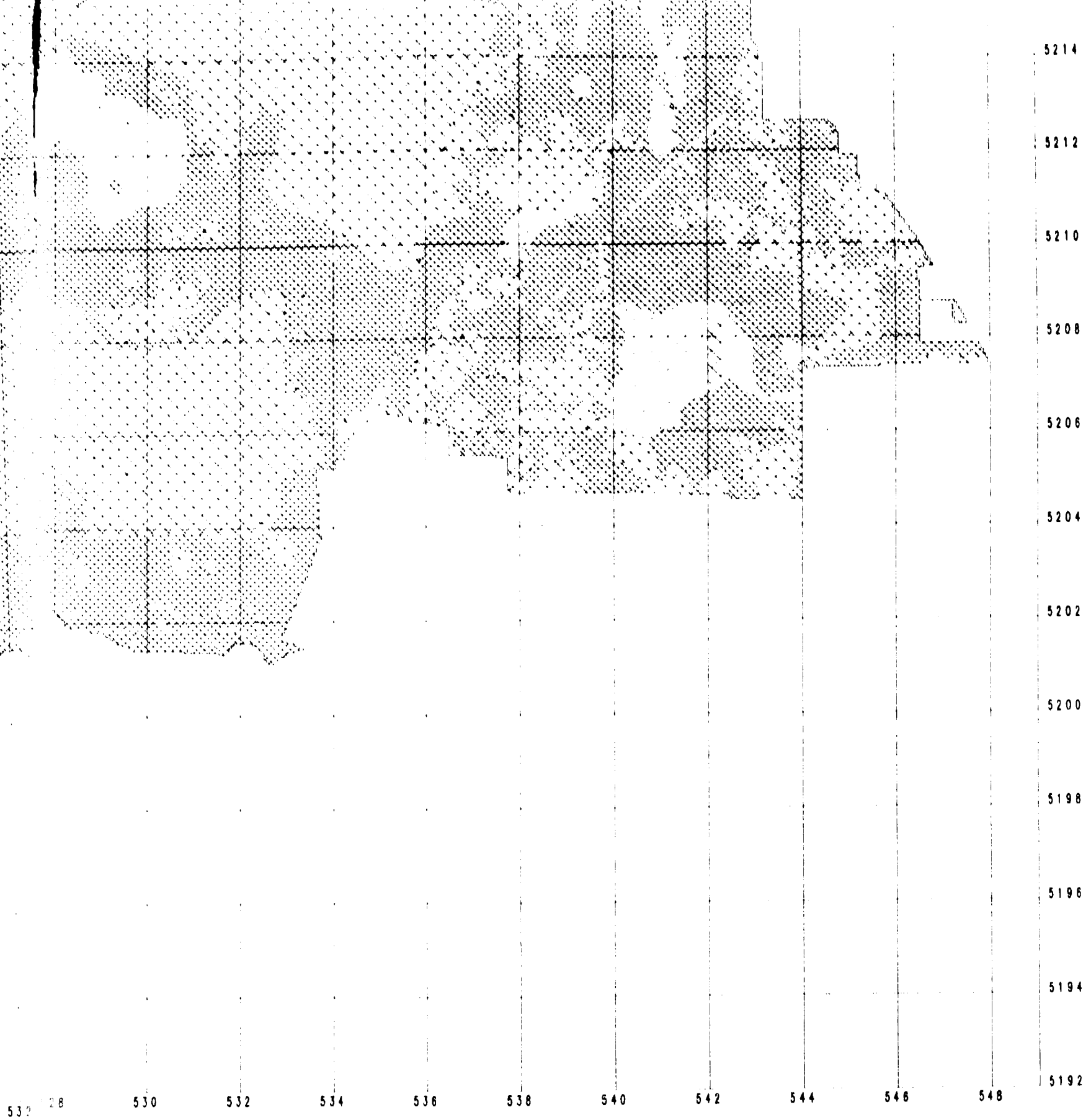
524

526

528

530

Plate 37. Rate of soil erosion for



3-5 erosion for 3-3-5 and 4-3-3 (HMMWV) force structures in the wet slippery surface condition

5214

5212

5210

5208

5206

5204

5202

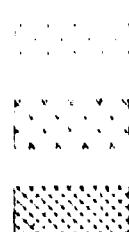
5200

5198

5196

5194

5192



NO EROSION

> 0 - 1

> 1 - 5

> 10 - 20

> 20 - 30

> 30 - 40

> 40

FT. LEWIS, WASHINGTON

3-3-5 FORCE STRUCTURE

WET SEASON

SLIPPERY CONDITION

50 PASSES

N

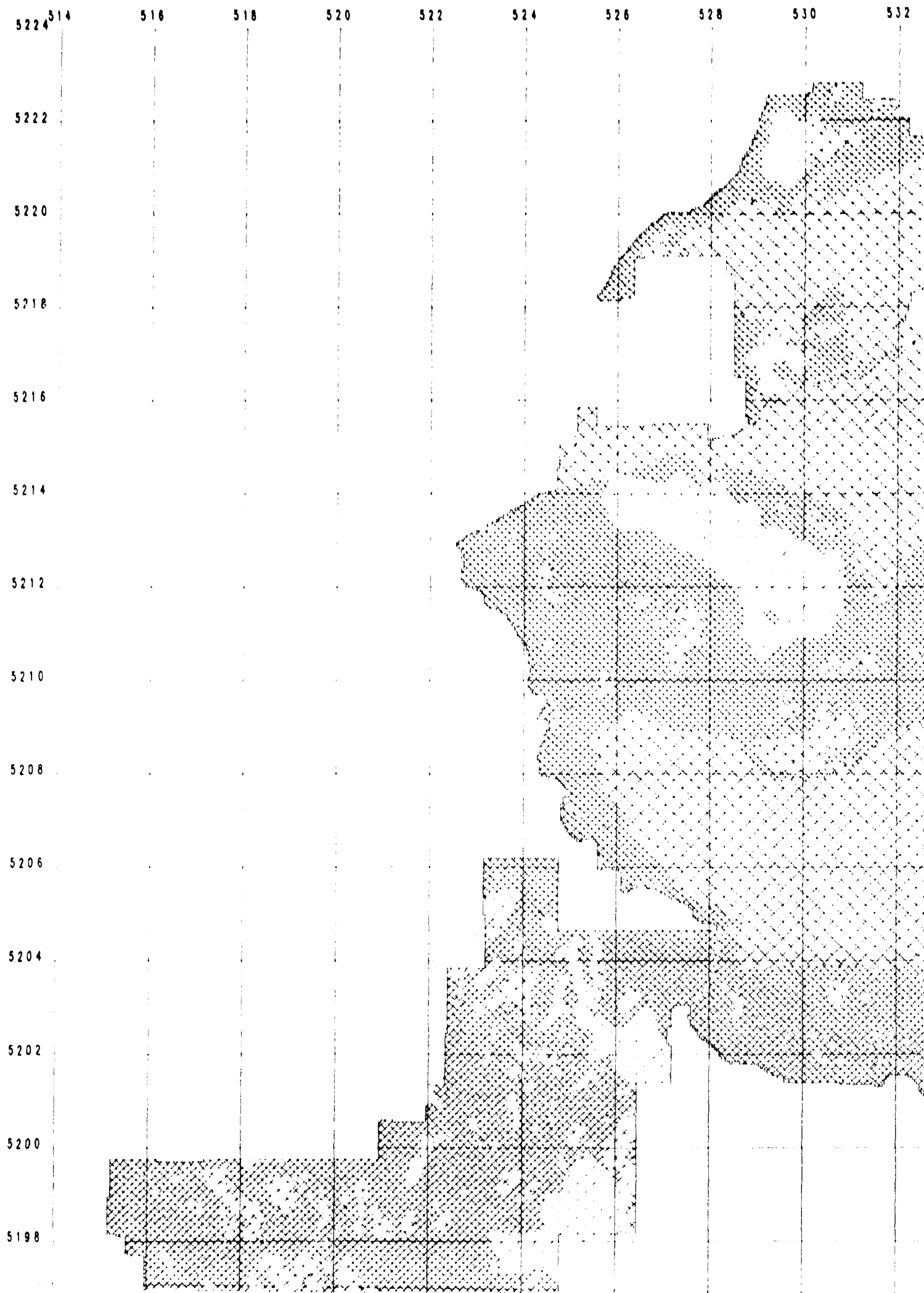
METERS

0 2000 4000 6000

546

548

for
y surface condition for fifty passes



526

528

530

532

534

536

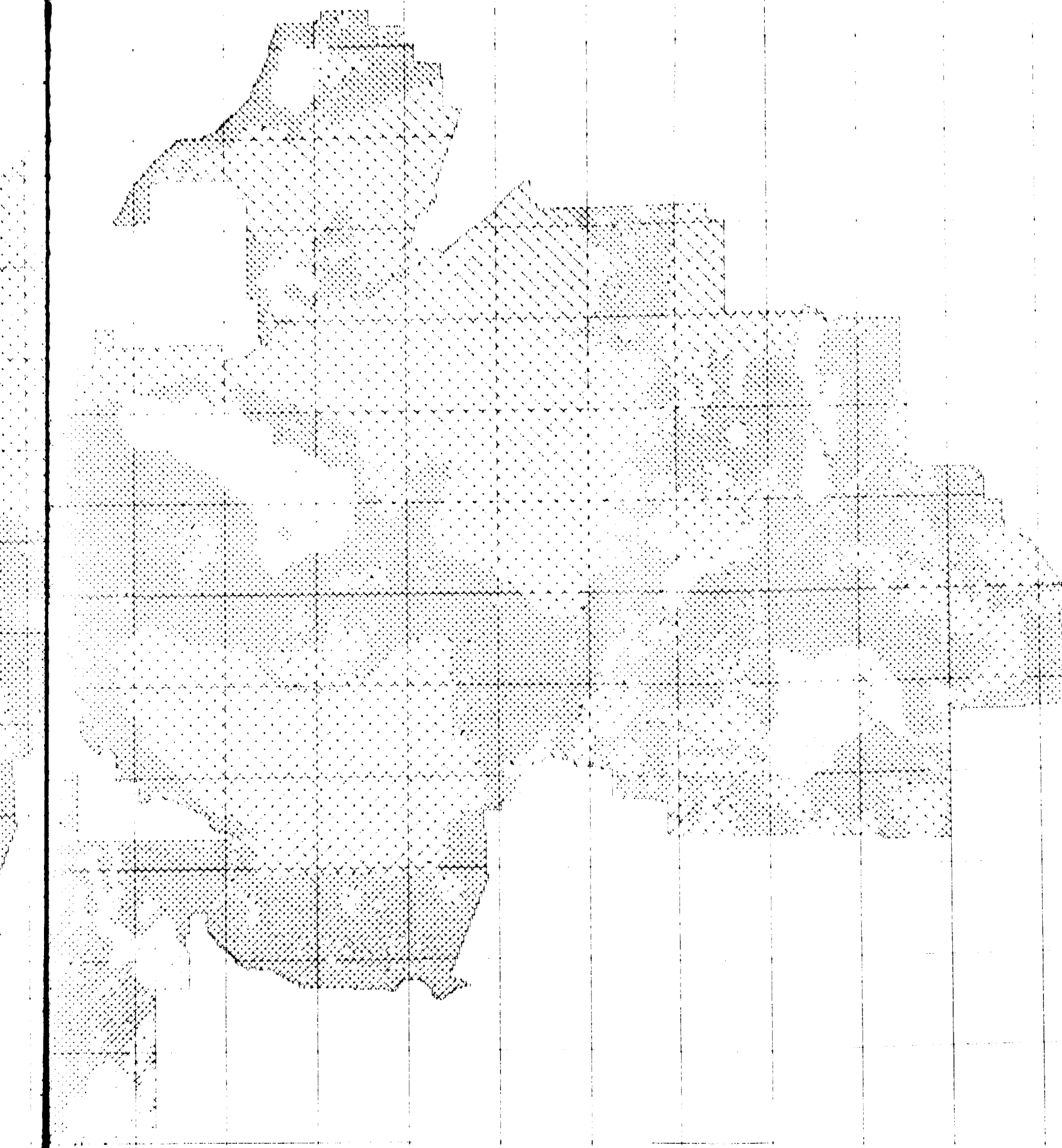
538

540

542

544

546



544

546

548

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

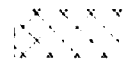
5202

5200



U. S. Army Corps of Engineers
Waterways
Experiment
Station

RATE OF SOIL EROSION
(TONS/ACRE/YEAR)
SCALE 1:100000



URBAN/
OFF LIMITS



> 5 - 10



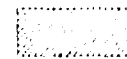
NO EROSION



> 10 - 20



> 0 - 1



> 20 - 30



> 1 - 5



> 30 - 40



> 40

FT. LEWIS, WASHINGTON

3-3-5 FORCE STRUCTURE
WET SEASON

SLIPPERY CONDITION
1000 PASSES

5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

5194

5192

514

516

518

520

522

524

526

528

530

532

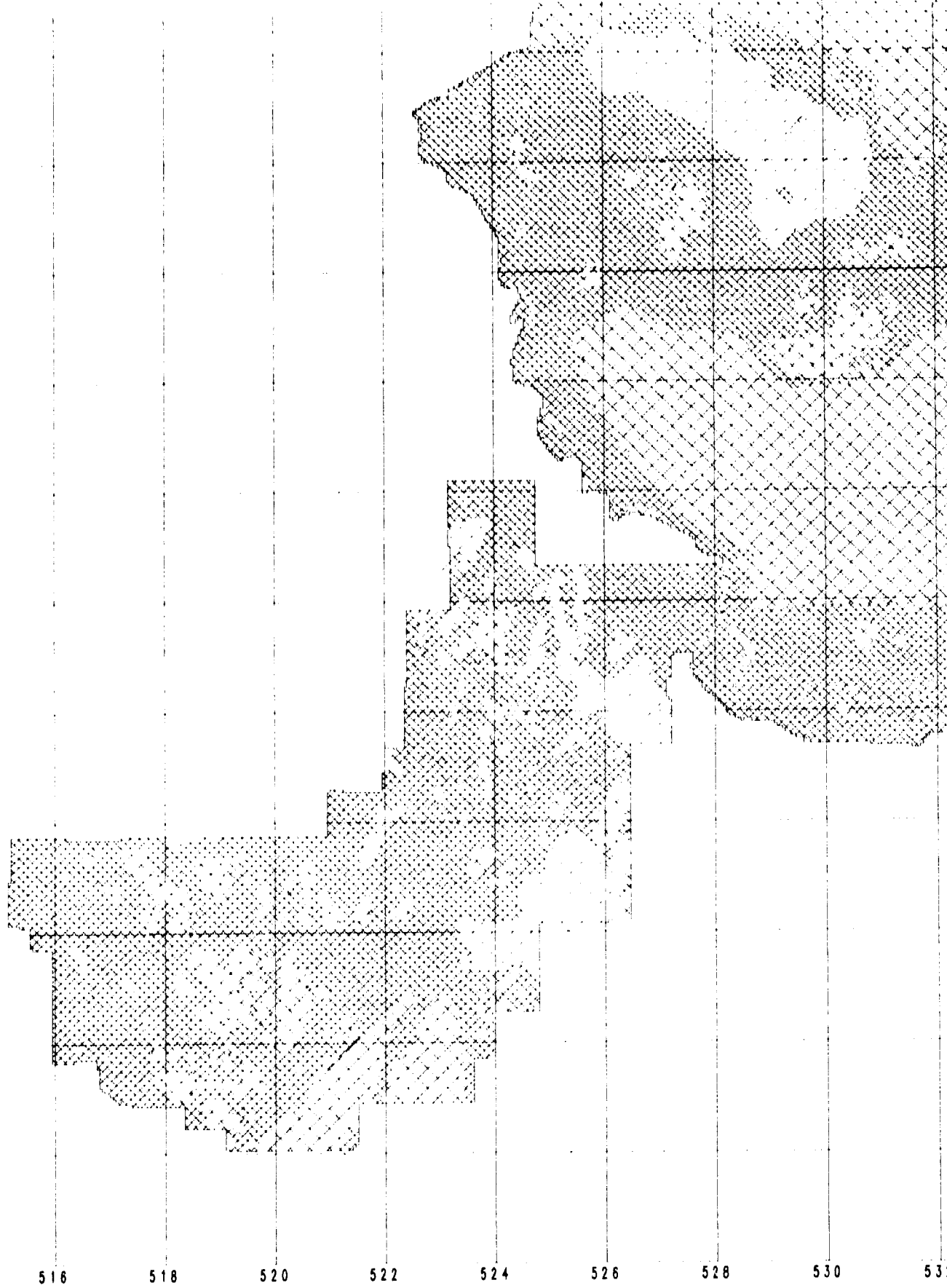
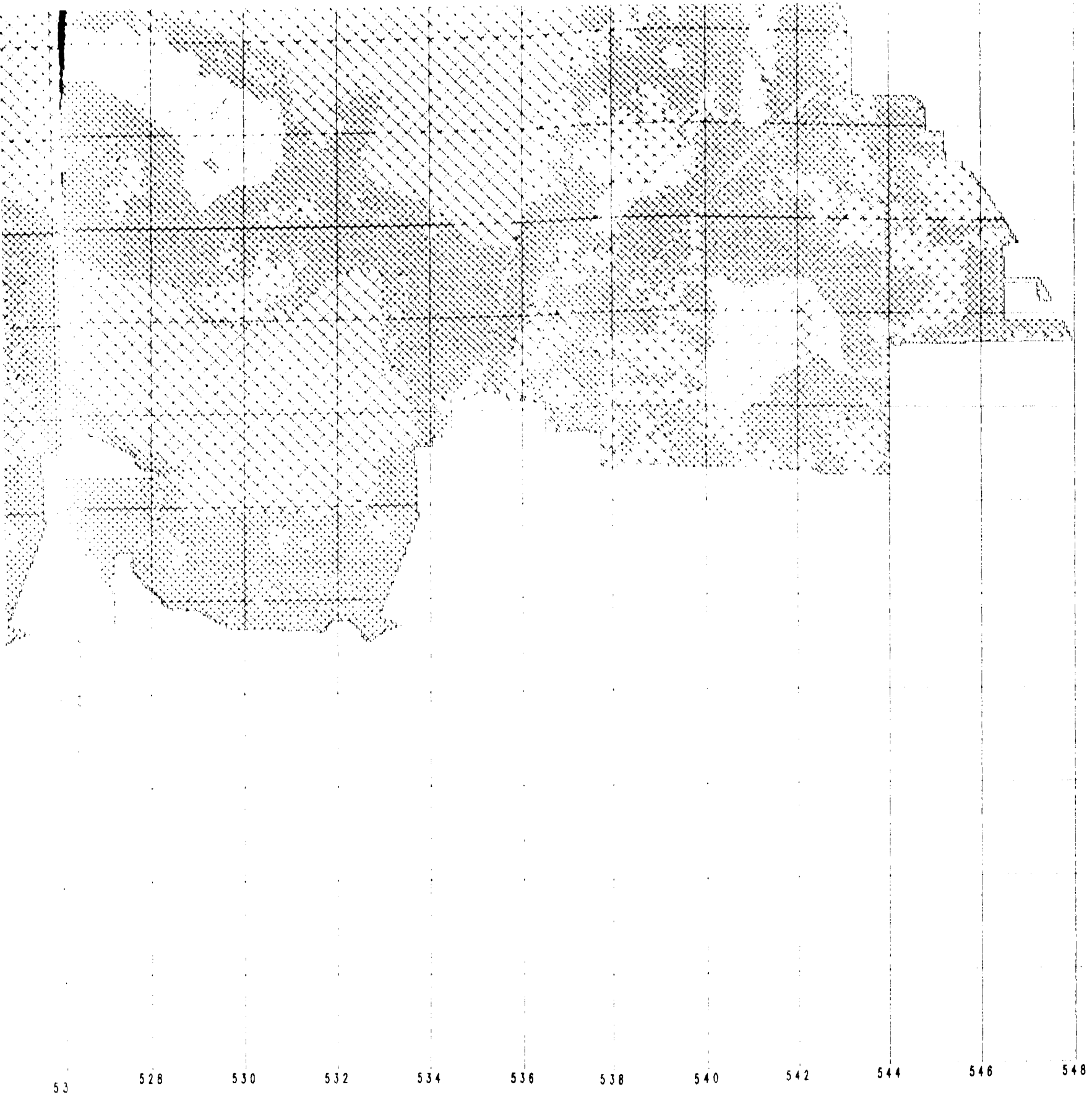
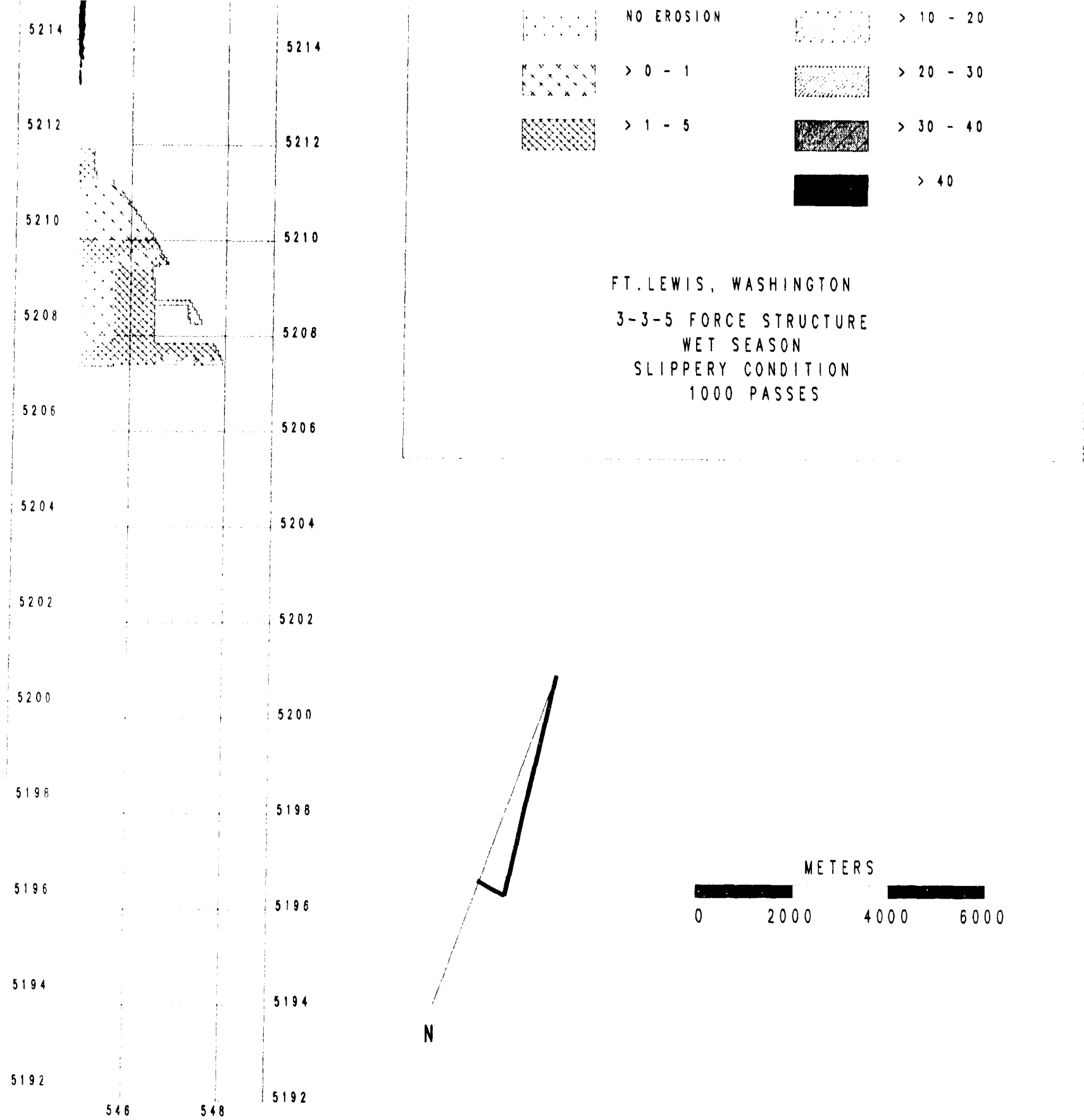


Plate 38. Rate of soil erosion for 3-3-5 and 5-3-3



3-3 oil erosion for 3-3-5 and 4-3-3 (HMMWV) force structures in the wet slippery surface condi



on for surface condition for one thousand passes

5224⁵¹⁴

516

518

520

522

524

526

528

530

532

5222

5220

5218

5216

5214

5212

5210

5208

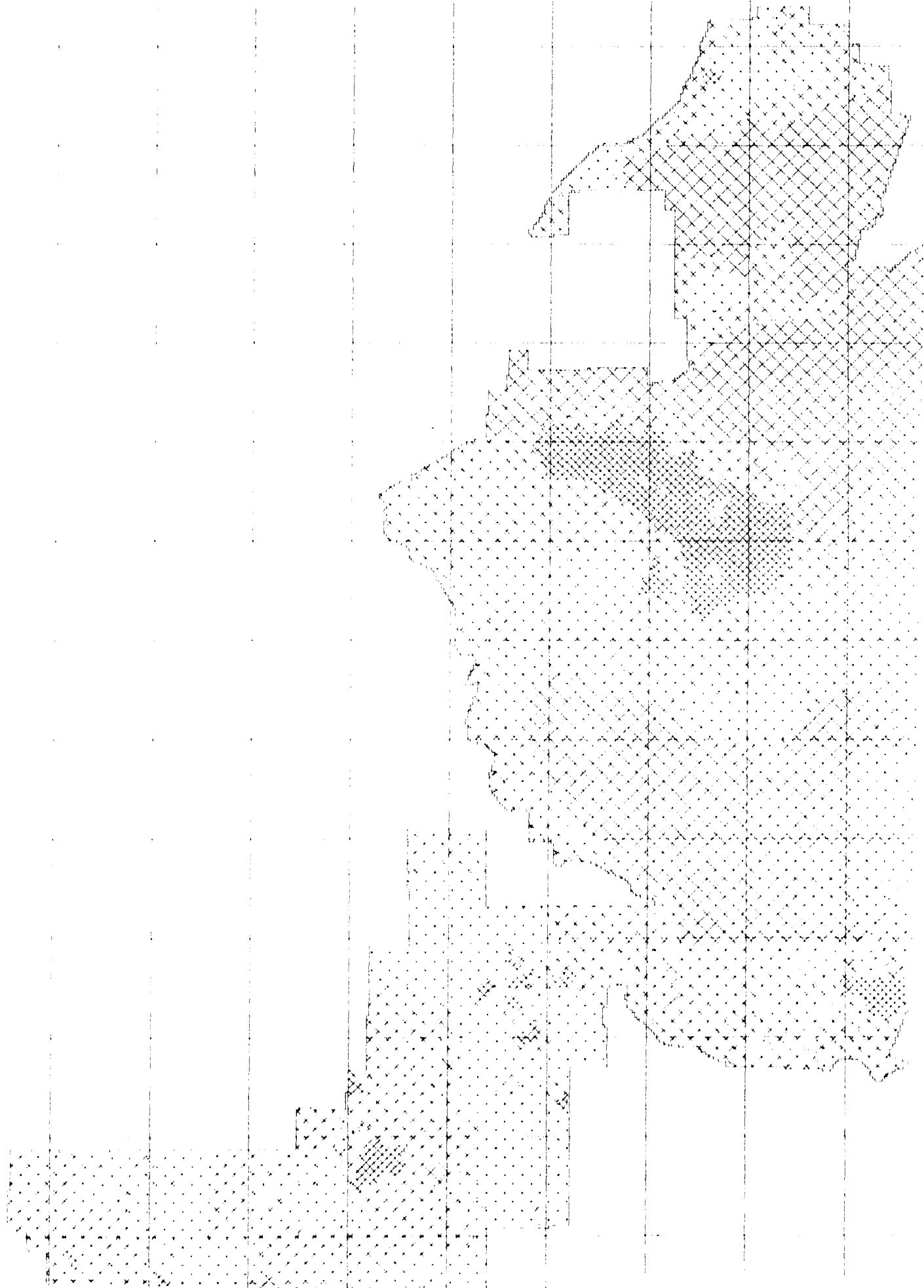
5206

5204

5202

5200

5198



526

528

530

532

534

536

538

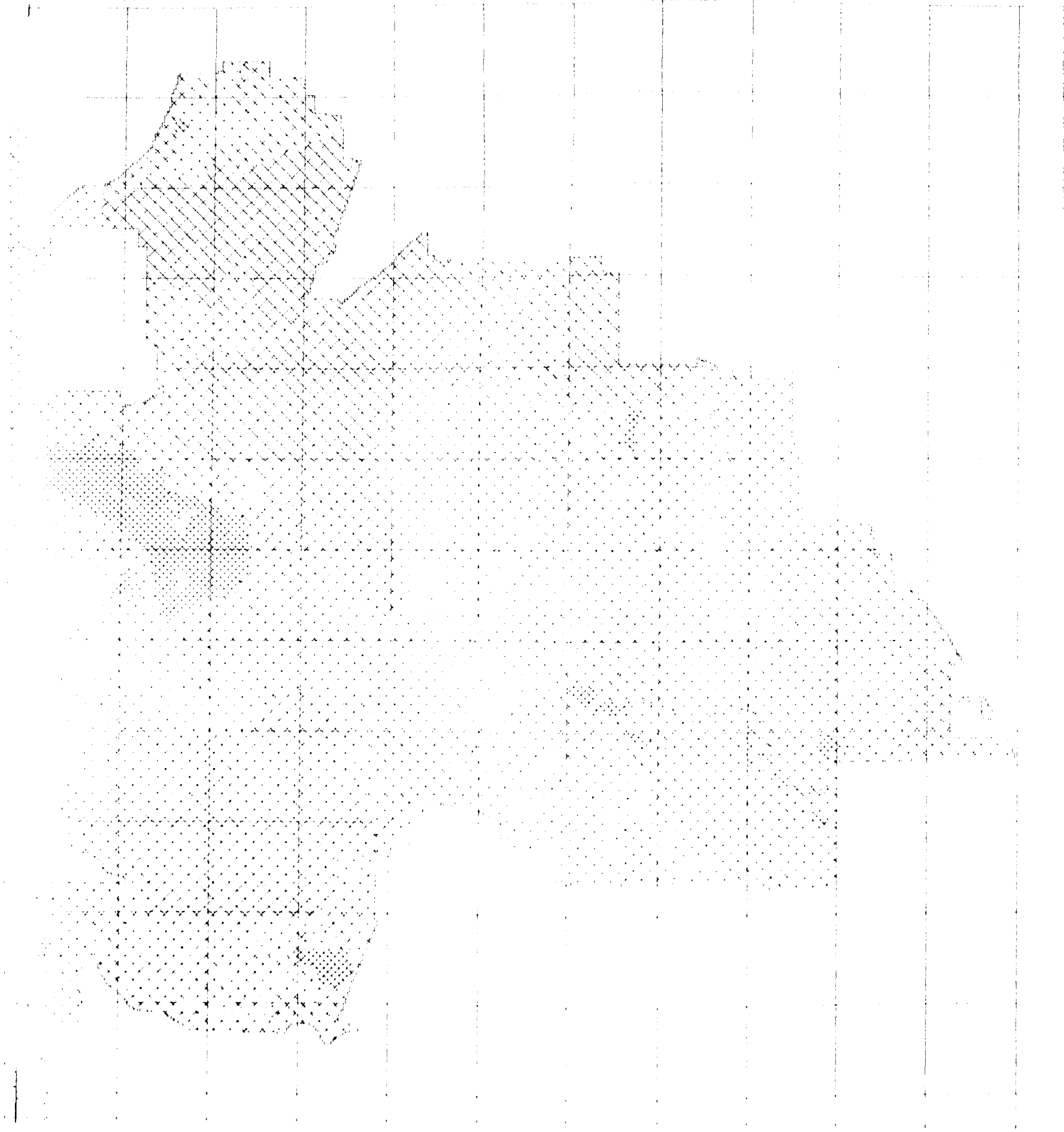
540

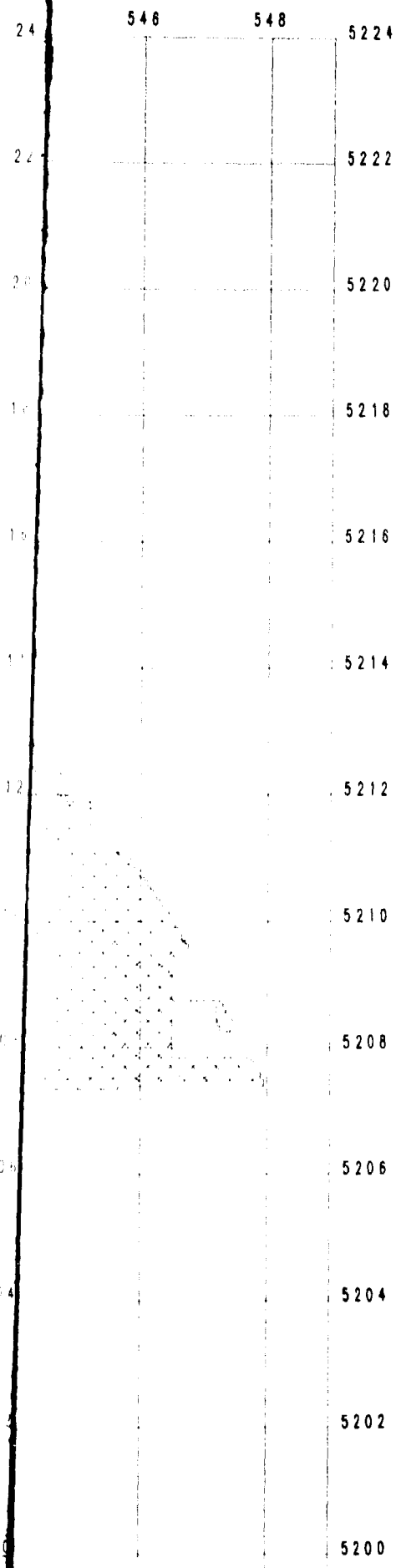
542

544

546

548





U. S. Army Corps of Engineers
 Waterways
 Experiment
 Station

RATE OF SOIL EROSION
 (TONS/ACRE/YEAR)
 SCALE 1:100000

	URBAN/ OFF LIMITS		> 5 - 10
	NO EROSION		> 10 - 20
	> 0 - 1		> 20 - 30
	> 1 - 5		> 30 - 40
			> 40

FT. LEWIS, WASHINGTON
 4-3-3 FORCE STRUCTURE
 DRY SEASON
 NORMAL CONDITION
 10 PASSES

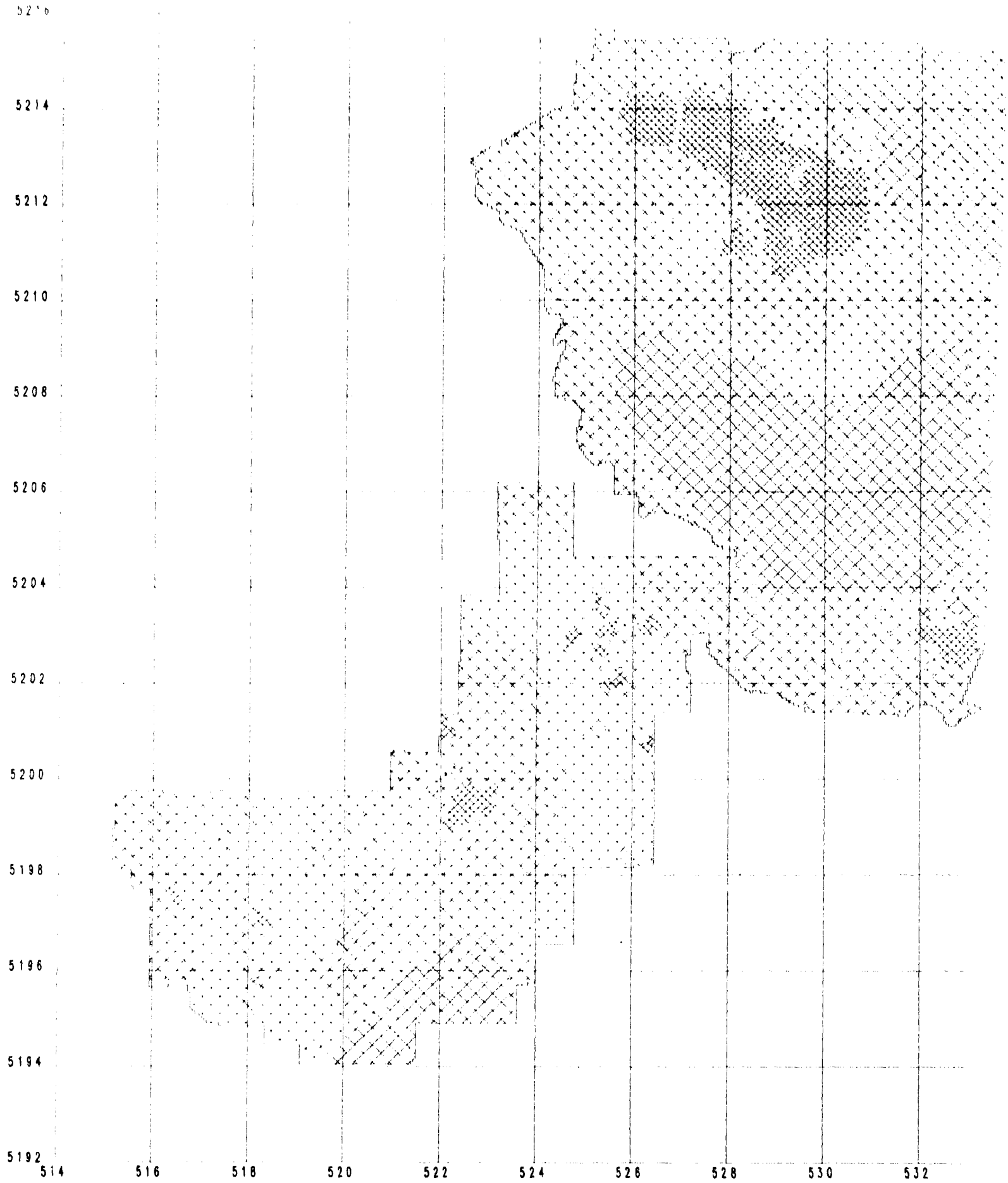
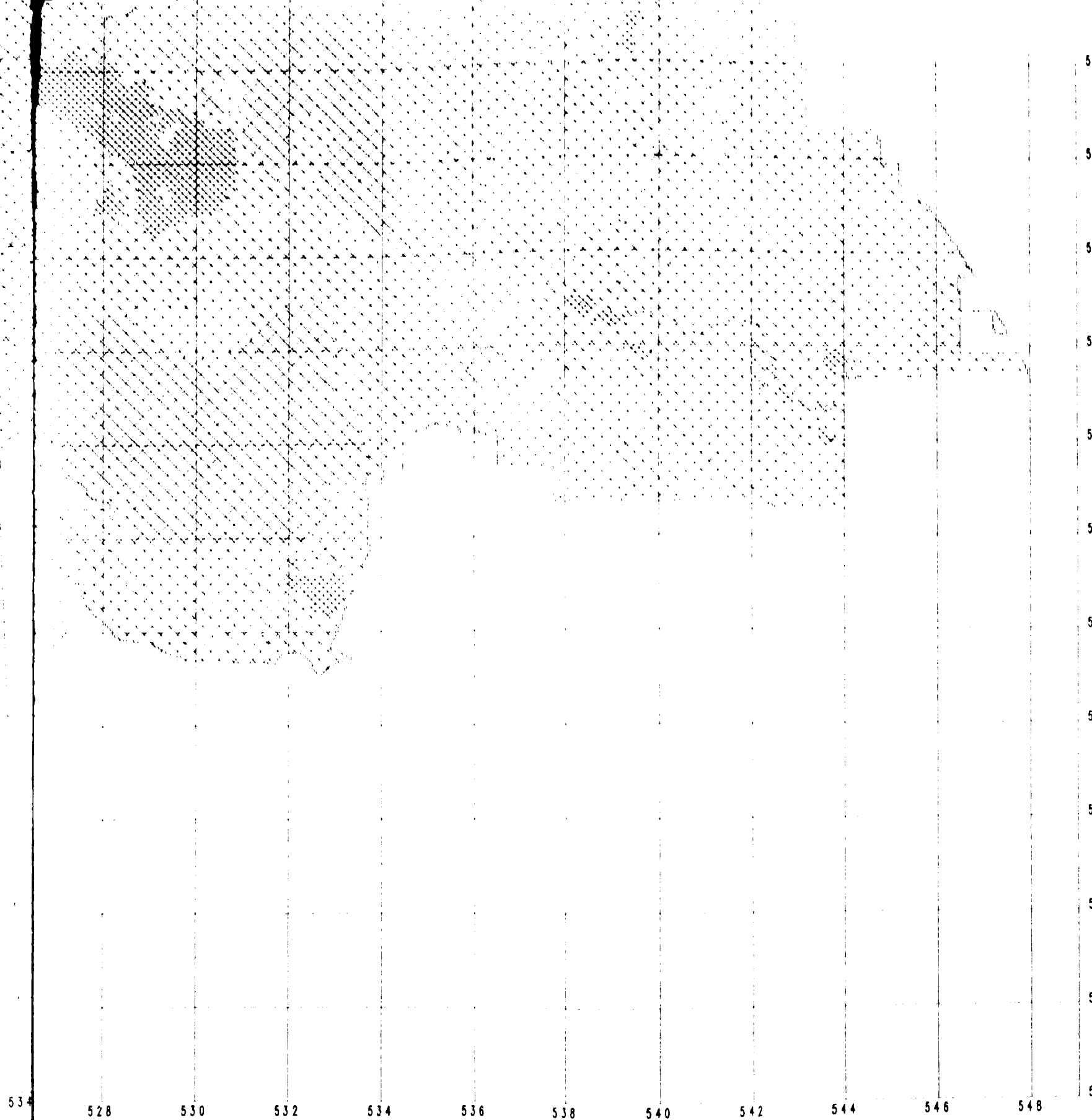
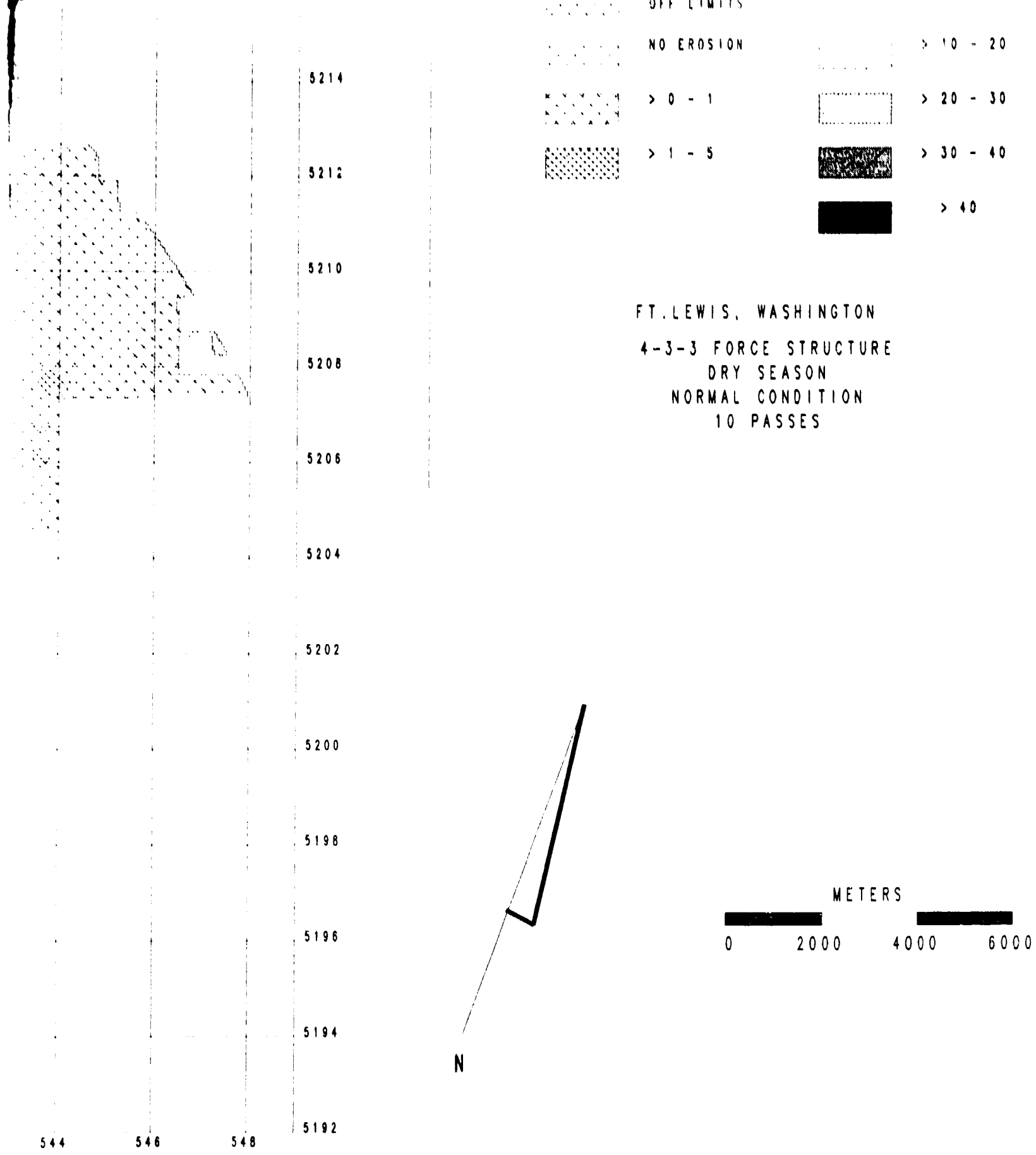


Plate 39. Rate of soil erosion for



Rate of soil erosion for the 4-3-3 (8X8) force structure in the dry normal surface condition



fo
lry normal surface condition for ten passes

5224⁵¹⁴

516

518

520

522

524

526

528

530

53

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

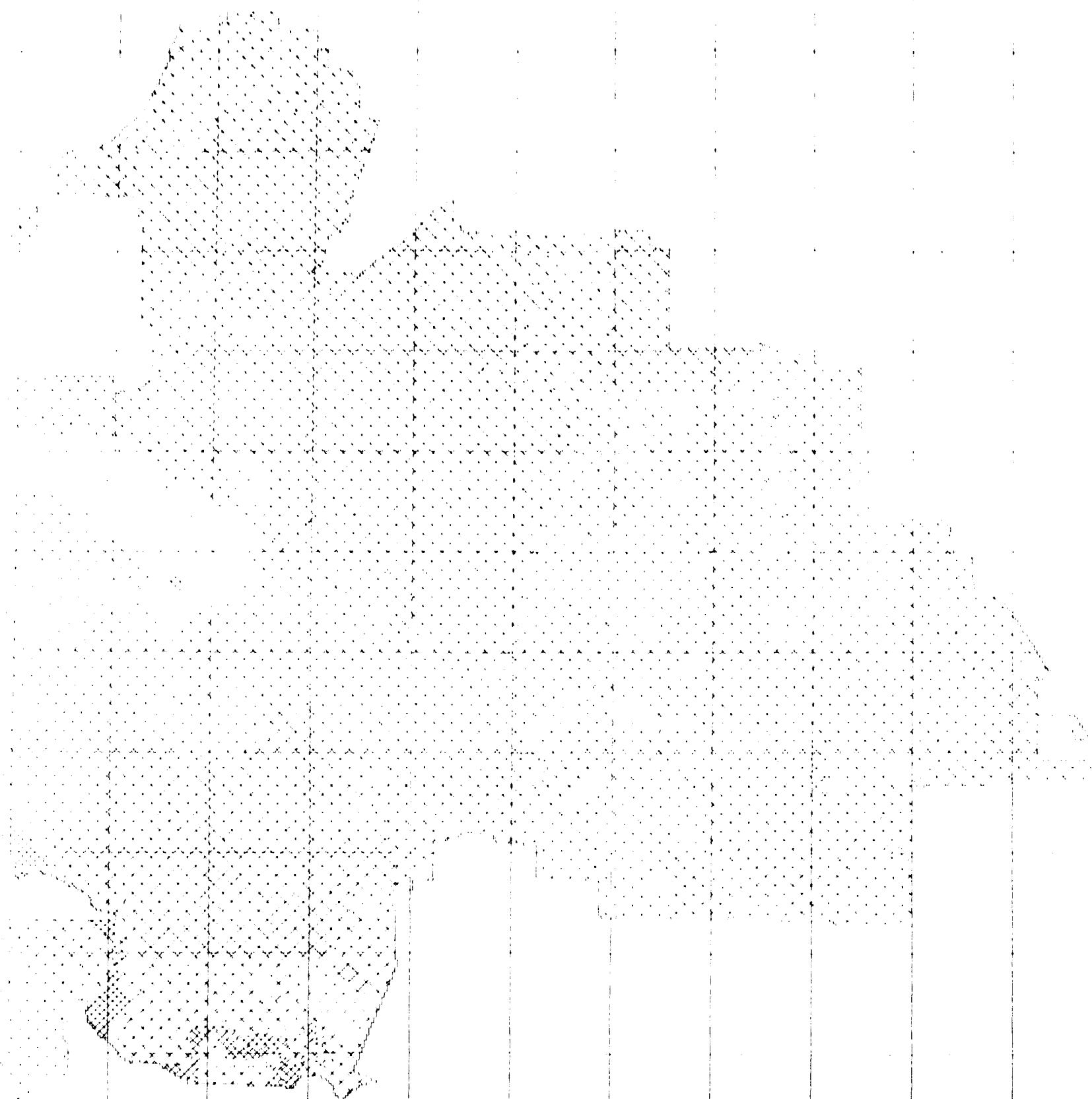
5202

5200

5198



526 528 530 532 534 536 538 540 542 544 546 5



548

548

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200



U. S. Army Corps of Engineers
Waterways
Experiment
Station

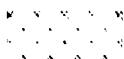
RATE OF SOIL EROSION
(TONS/ACRE/YEAR)
SCALE 1:100000



URBAN/
OFF LIMITS



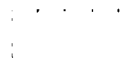
NO EROSION



> 0 - 1



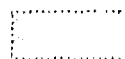
> 1 - 5



> 5 - 10



> 10 - 20



> 20 - 30



> 30 - 40



> 40

FT. LEWIS, WASHINGTON

4-3-3 FORCE STRUCTURE

DRY SEASON

NORMAL CONDITION

50 PASSES

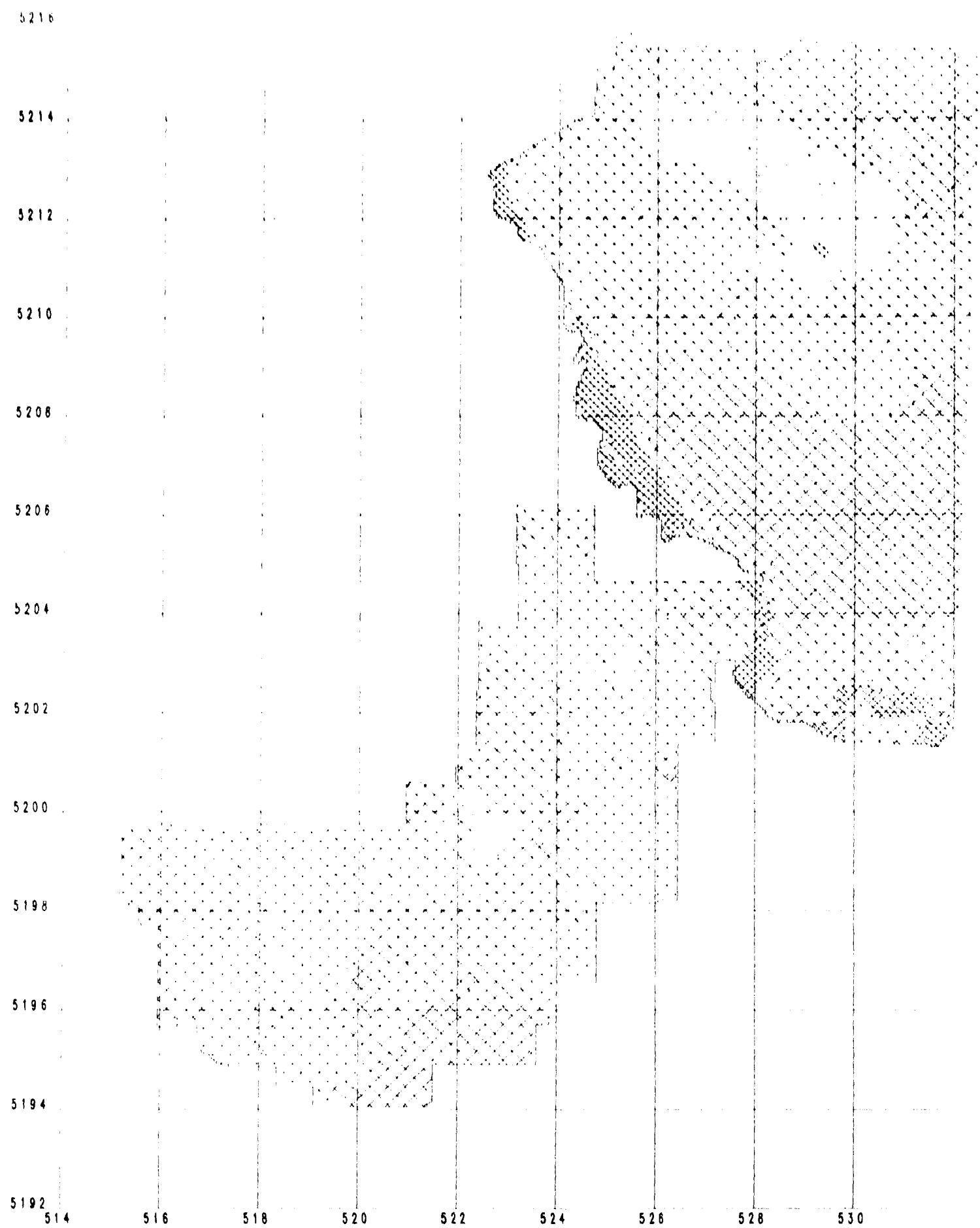


Plate 40. Rate of soil erosion

528

530

532

534

536

538

540

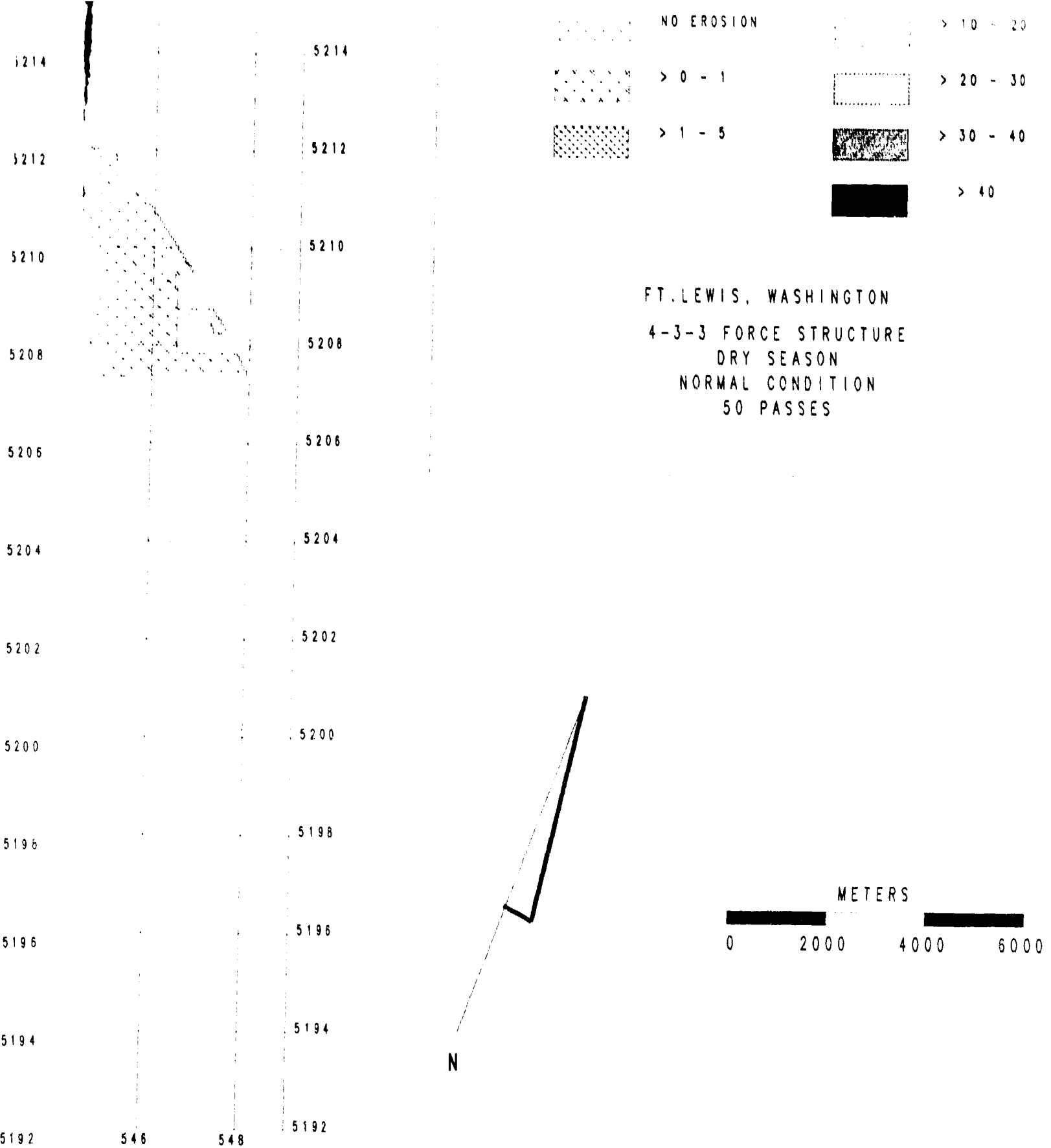
542

544

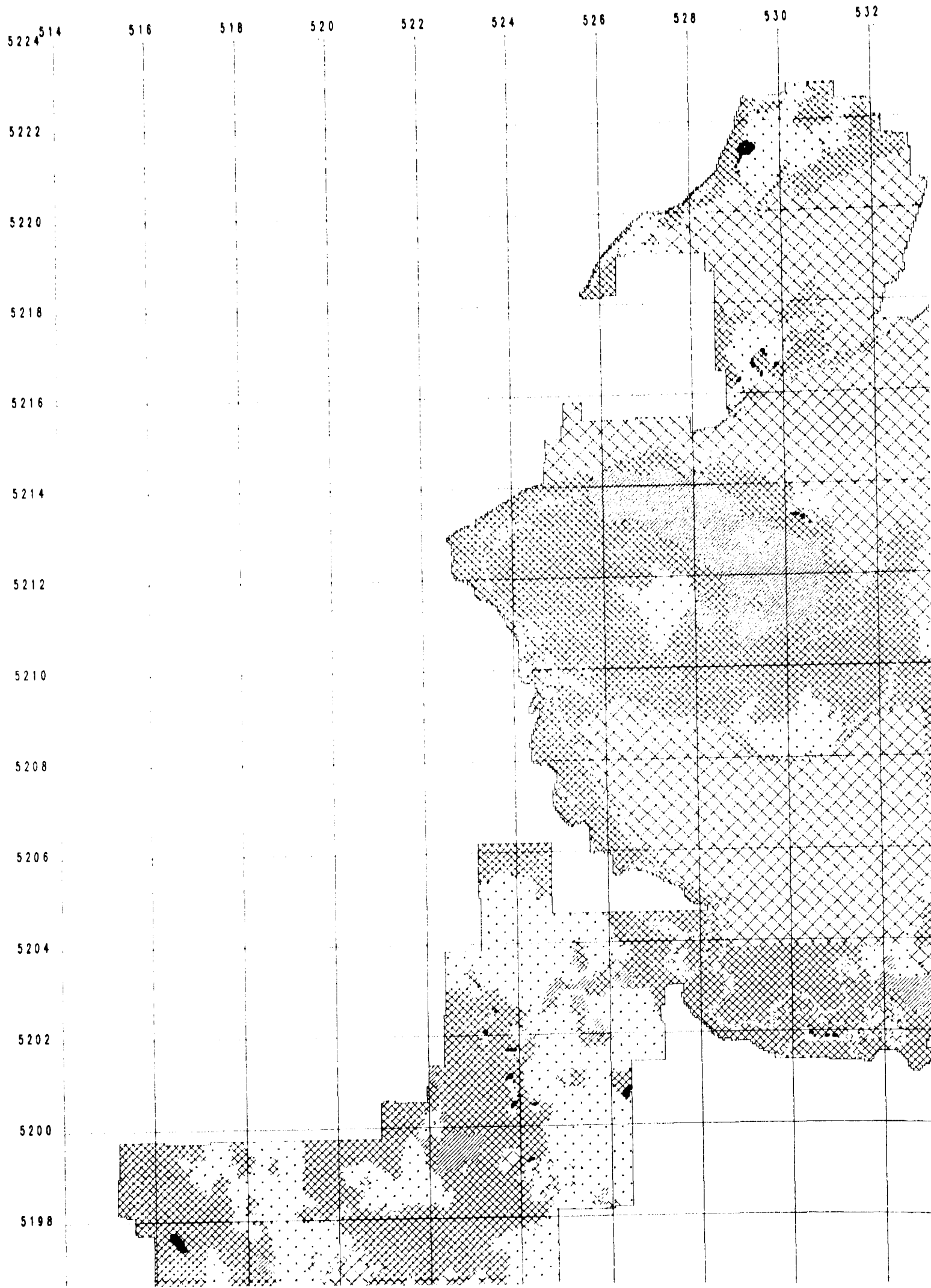
546

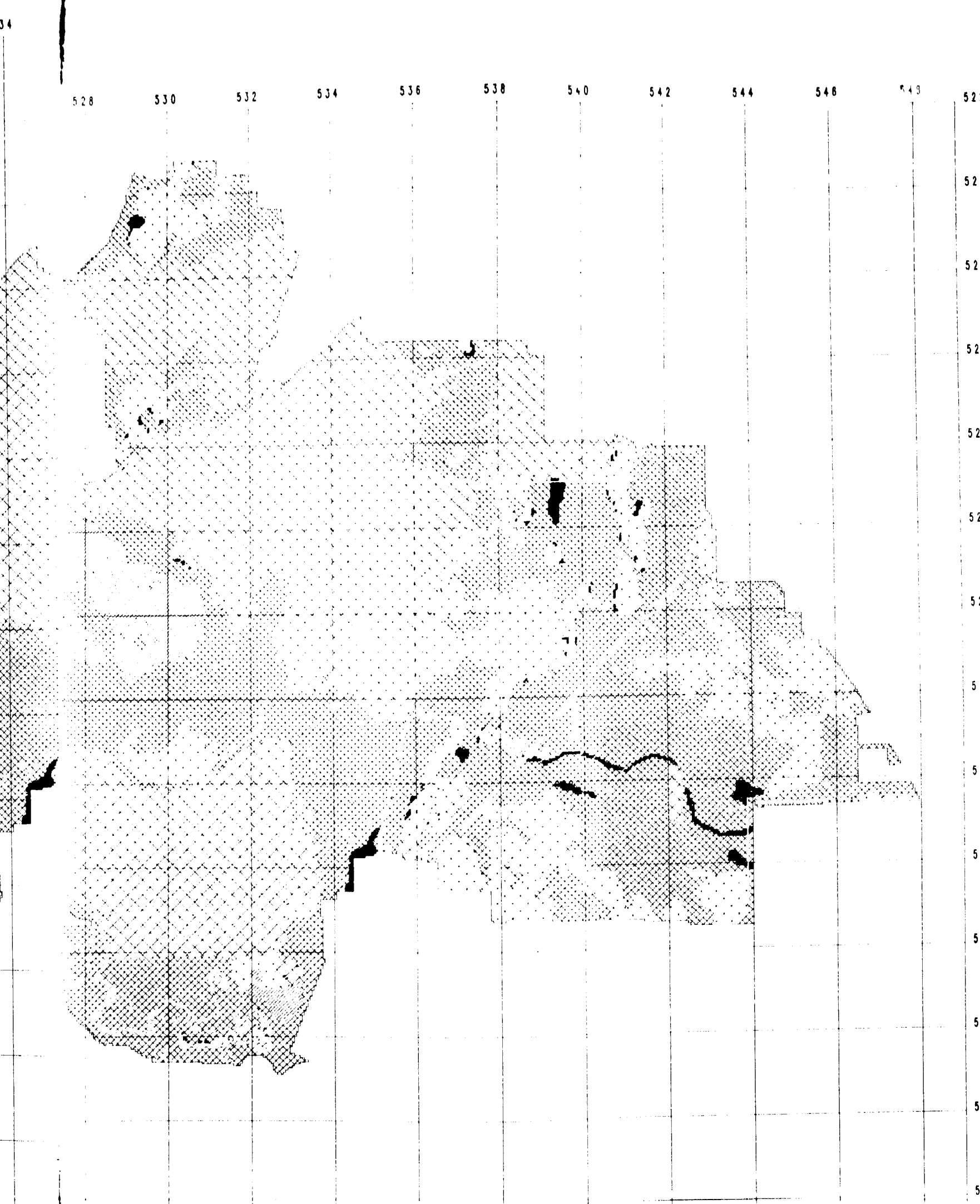
548

the rate of soil erosion for the 4-3-3 (8X8) force structure in the dry normal surface condit



n for 1 surface condition for fifty passes





549

5224

5222



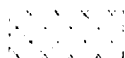
U. S. Army Corps of Engineers
Waterways
Experiment
Station

5220

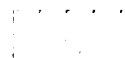
RATE OF SOIL EROSION
(TONS/ACRE/YEAR)
SCALE 1:100000

5218

5216



URBAN/
OFF LIMITS

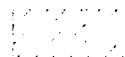


> 5 - 10

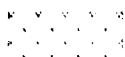
5214



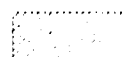
NO EROSION



> 10 - 20



> 0 - 1



> 20 - 30

5212



> 1 - 5



> 30 - 40



> 40

5210

FT. LEWIS, WASHINGTON

5208

4-3-3 FORCE STRUCTURE

DRY SEASON

NORMAL CONDITION

1000 PASSES

5205

5204

5202

5200

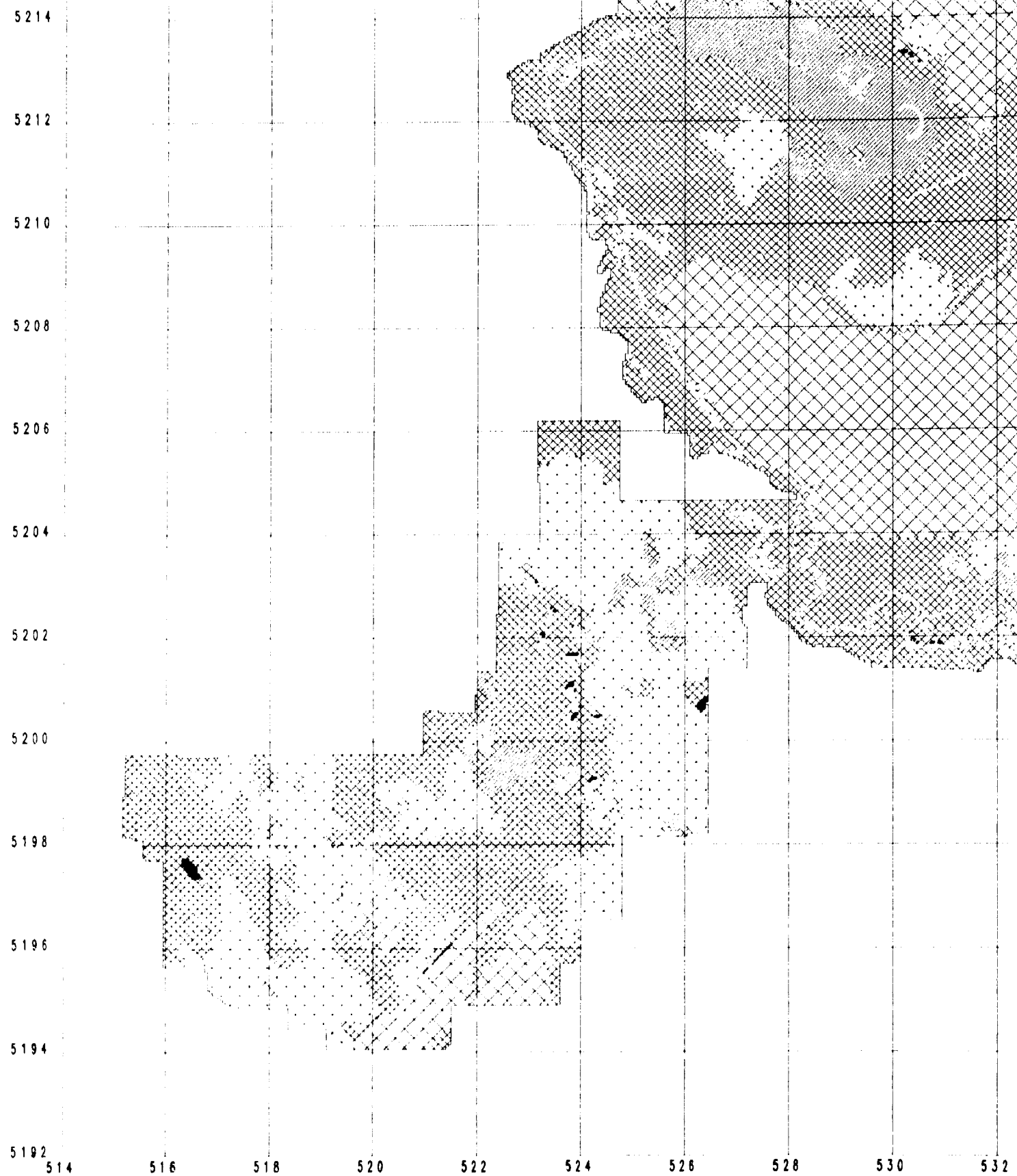
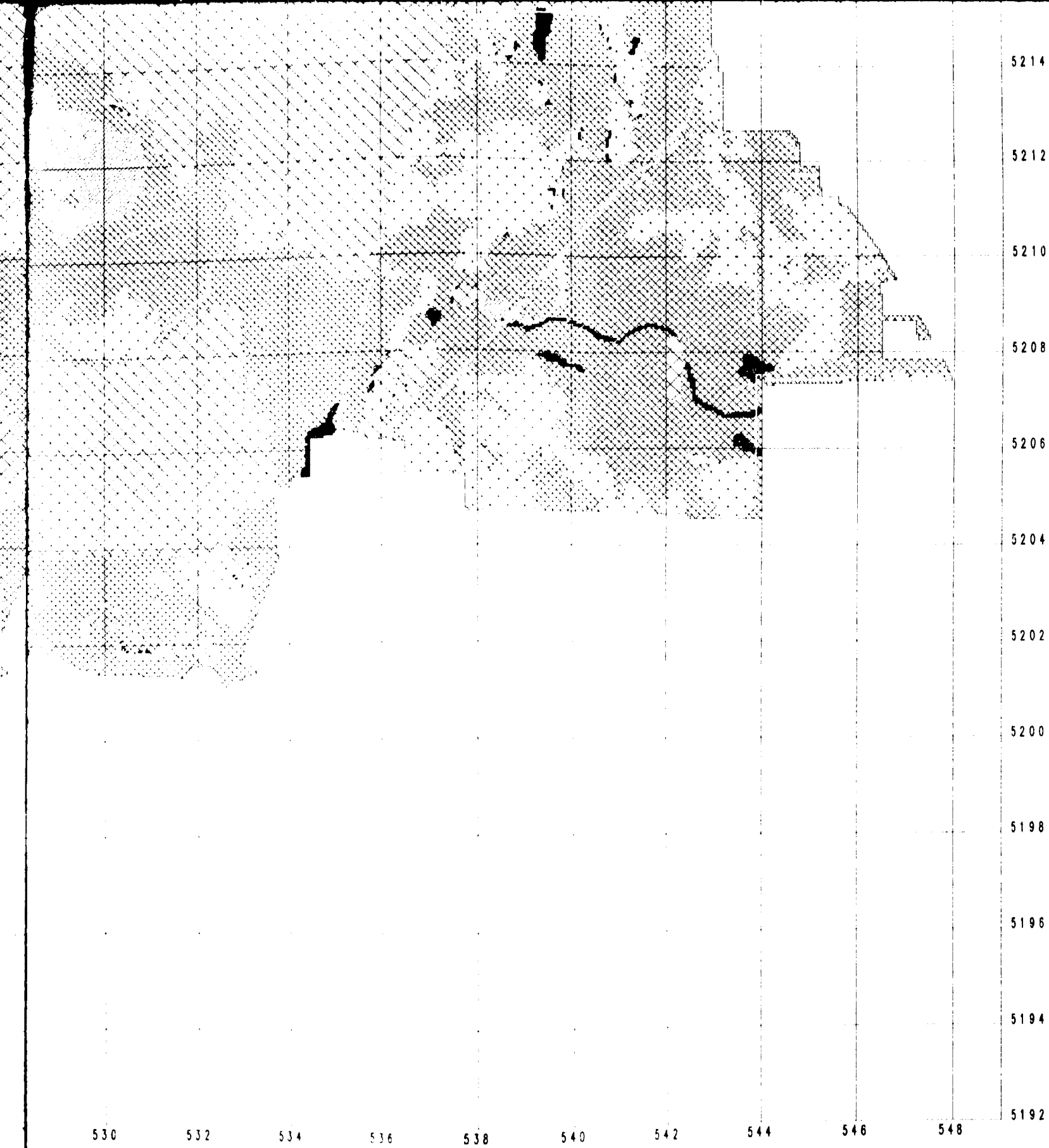


Plate 41. Rate of soil erosion for t



4- Soil erosion for the 4-3-3 (8X8) force structure in the dry normal surface condition for one t

5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

5194

5192



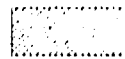
NO EROSION



> 10 - 20



> 0 - 1



> 20 - 30



> 1 - 5



> 30 - 40



> 40

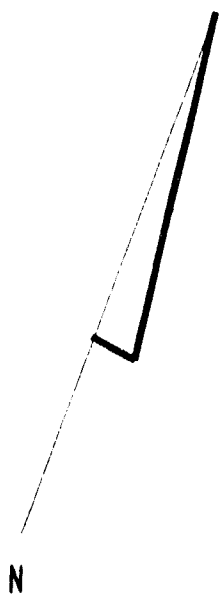
FT. LEWIS, WASHINGTON

4-3-3 FORCE STRUCTURE

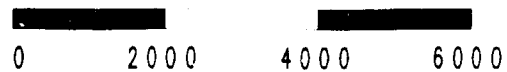
DRY SEASON

NORMAL CONDITION

1000 PASSES



METERS



N

546

548

surface condition for one thousand passes

5224 514 516 518 520 522 524 526 528 530 532

5222

5220

5218

5216

5214

5212

5210

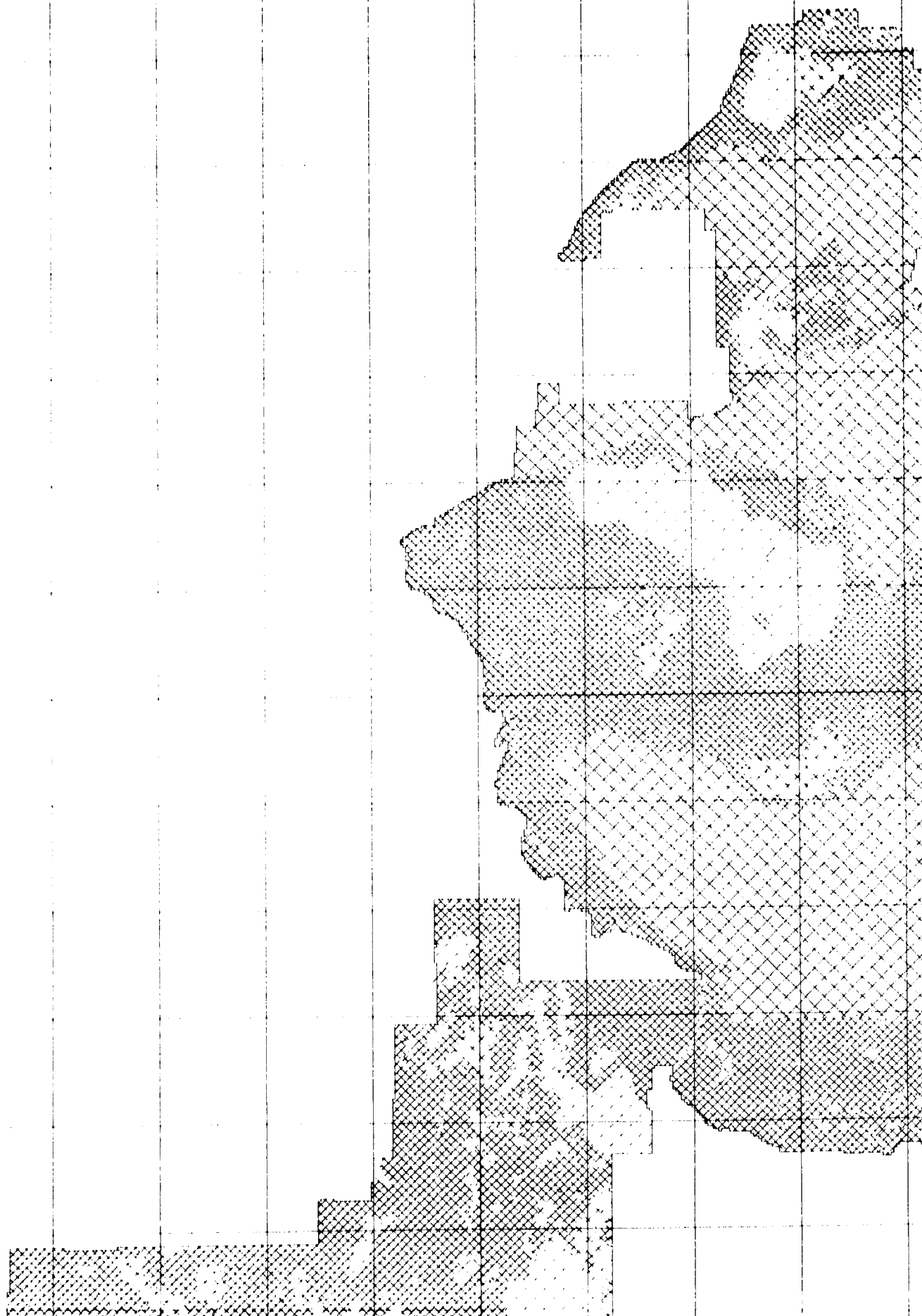
5208

5206

5204

5202

5200



526

528

530

532

534

536

538

540

542

544

546

548



540

540

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

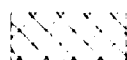
5202

5200

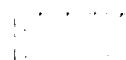


U. S. Army Corps of Engineers
Waterways
Experiment
Station

RATE OF SOIL EROSION
(TONS/ACRE/YEAR)
SCALE 1:100000



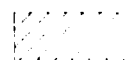
URBAN/
OFF LIMITS



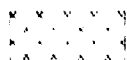
> 5 - 10



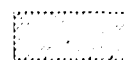
NO EROSION



> 10 - 20



> 0 - 1



> 20 - 30



> 1 - 5



> 30 - 40



> 40

FT. LEWIS, WASHINGTON

4-3-3 FORCE STRUCTURE
WET SEASON
SLIPPERY CONDITION
10 PASSES

5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

5194

5192

514

516

518

520

522

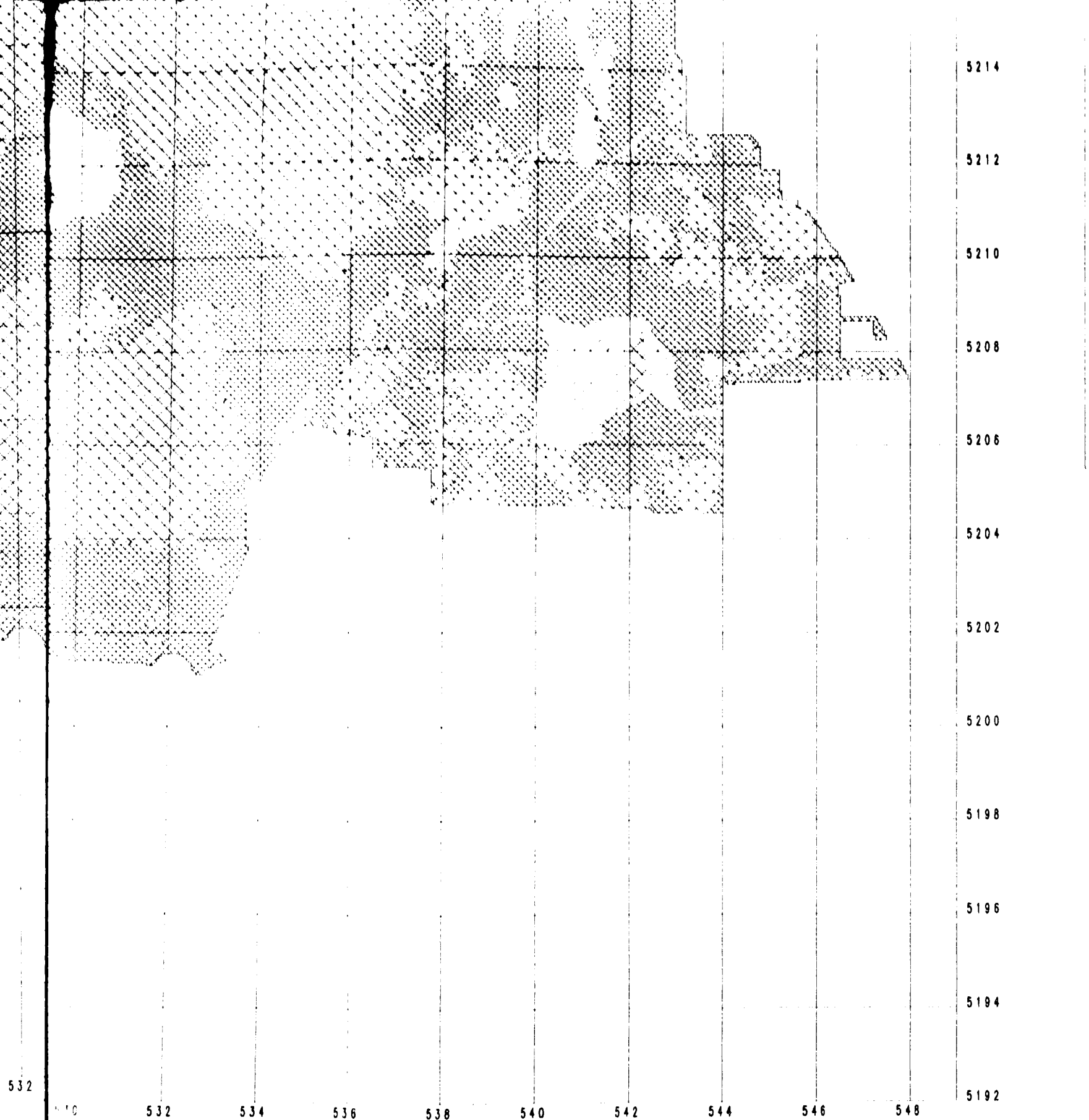
524

526

528

530

plate 42. Rate of soil ero



on f
l erosion for the 4-3-3 (8x8) force structure in the wet slippery surface condition for

5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

5194

5192

548

N

ORDINARY
OFF LIMITS

NO EROSION

> 0 - 1

> 1 - 5

> 10 - 20

> 20 - 30

> 30 - 40

> 40

FT. LEWIS, WASHINGTON

4-3-3 FORCE STRUCTURE

WET SEASON

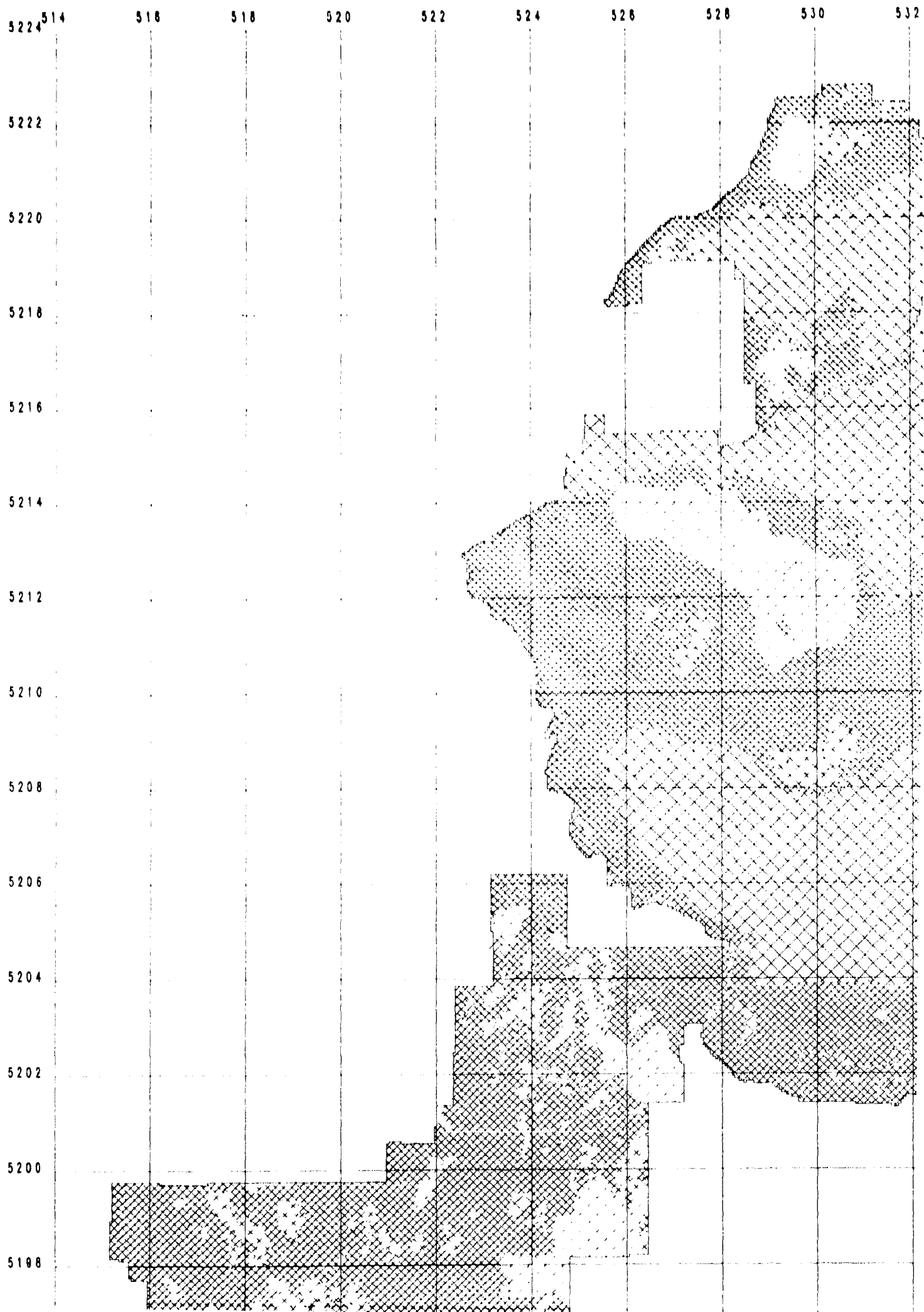
SLIPPERY CONDITION

10 PASSES

METERS



en pa
surface condition for ten passes



528

530

532

534

536

538

540

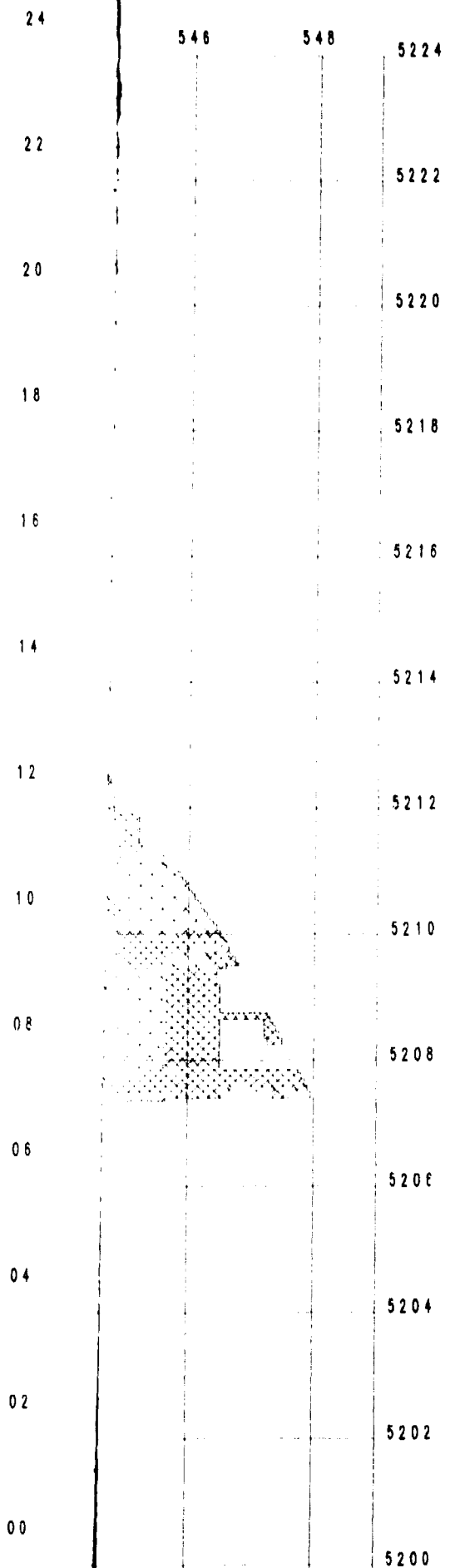
542

544

546

548





U. S. Army Corps of Engineers
Waterways
Experiment
Station

RATE OF SOIL EROSION
(TONS/ACRE/YEAR)
SCALE 1:100000

	URBAN/ OFF LIMITS		> 5 - 10
	NO EROSION		> 10 - 20
	> 0 - 1		> 20 - 30
	> 1 - 5		> 30 - 40
			> 40

FT. LEWIS, WASHINGTON
4-3-3 FORCE STRUCTURE
WET SEASON
SLIPPERY CONDITION
50 PASSES

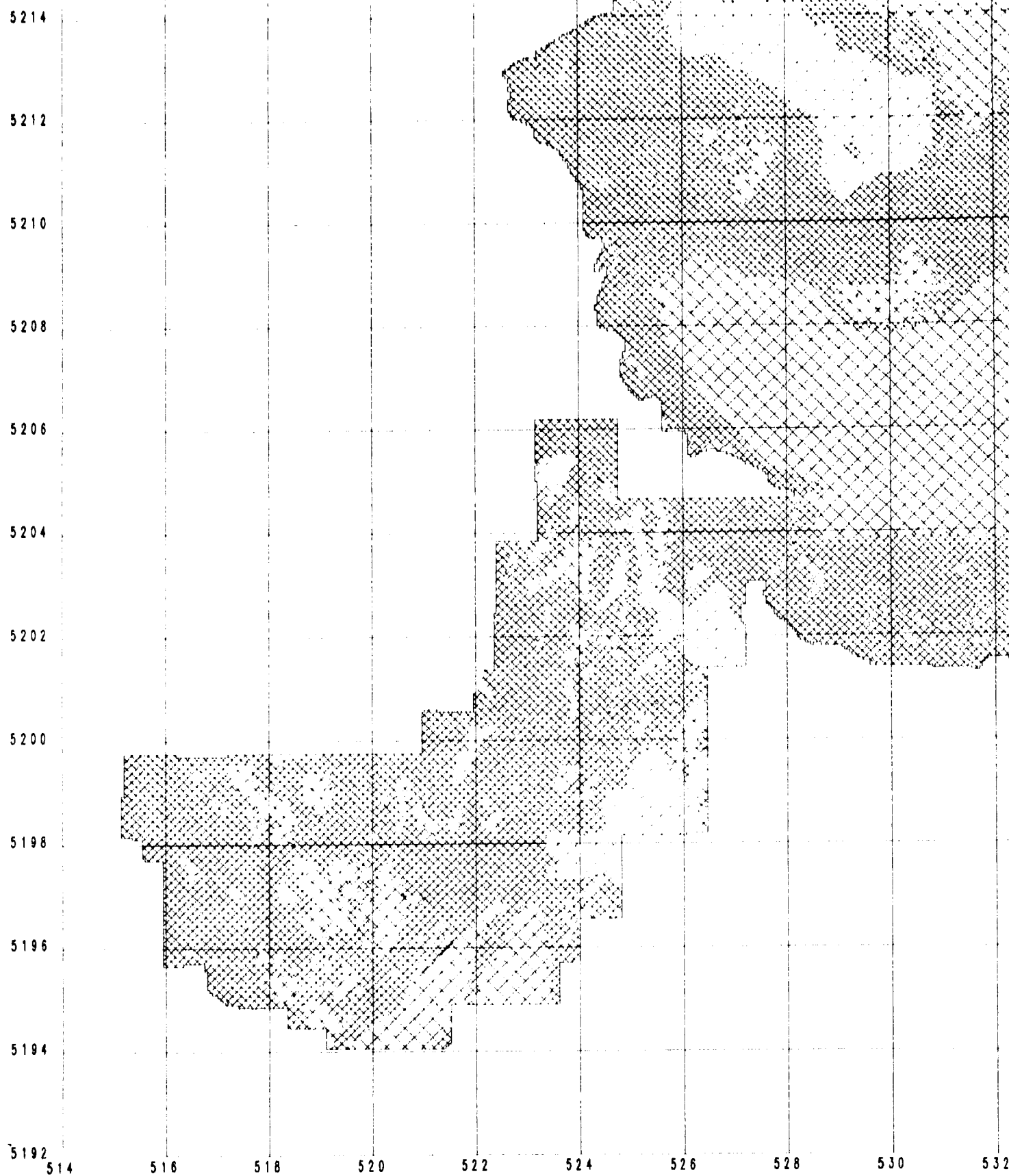
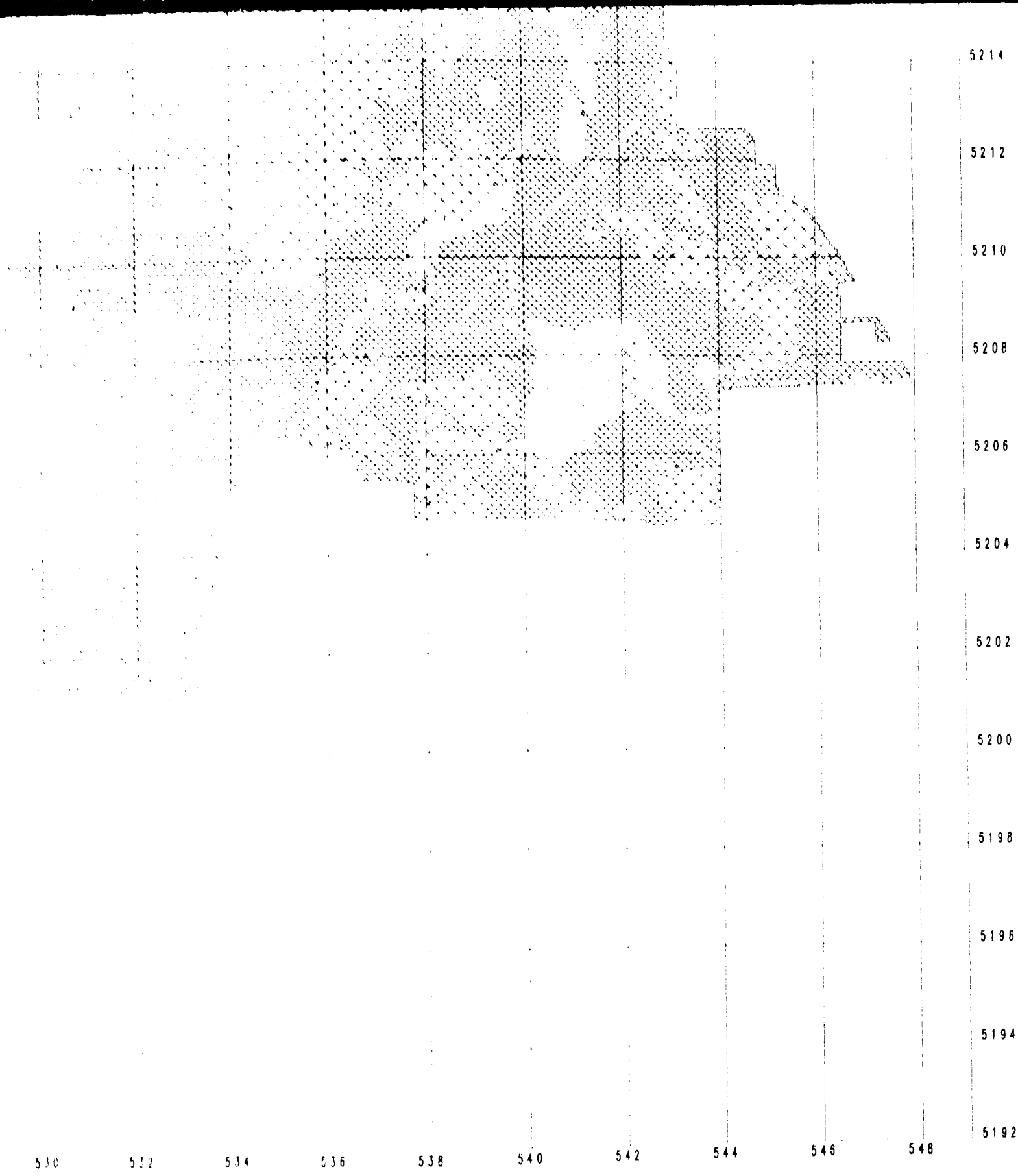


Plate 43. Rate of soil erosion for



erosion for the 4-3-3 (8X8) force structure in the wet slippery surface condition for

NO EROSION

5214

> 0 - 1

> 20 - 30

5212

> 1 - 5

> 30 - 40

5210

> 40

5208

FT. LEWIS, WASHINGTON

4-3-3 FORCE STRUCTURE

WET SEASON

SLIPPERY CONDITION

50 PASSES

5206

5204

5202

5200

5198

5196

5194

5192

METERS

0 2000 4000 6000

N

546

548

slippery surface condition for fifty passes

5224 514 516 518 520 522 524 526 528 530 532

5222

5220

5218

5216

5214

5212

5210

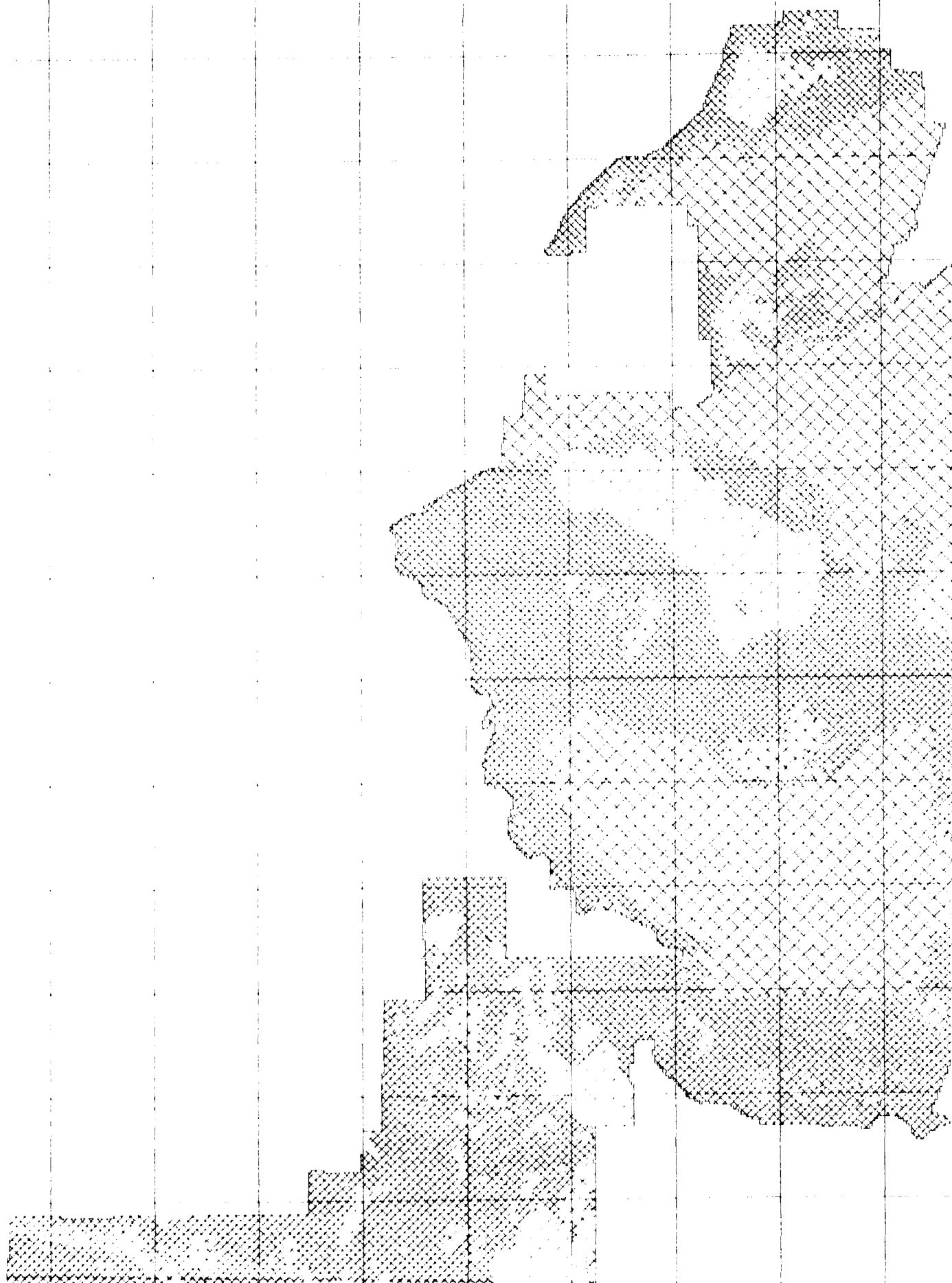
5208

5206

5204

5202

5200



530 532 534 536 538 540 542 544 546 548 5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200

546

548

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200



U. S. Army Corps of Engineers
Waterways
Experiment
Station

RATE OF SOIL EROSION
(TONS/ACRE/YEAR)
SCALE 1:100000



URBAN/
OFF LIMITS



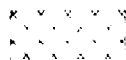
> 5 - 10



NO EROSION



> 10 - 20



> 0 - 1



> 20 - 30



> 1 - 5



> 30 - 40



> 40

FT. LEWIS, WASHINGTON

4-3-3 FORCE STRUCTURE
WET SEASON
SLIPPERY CONDITION
1000 PASSES

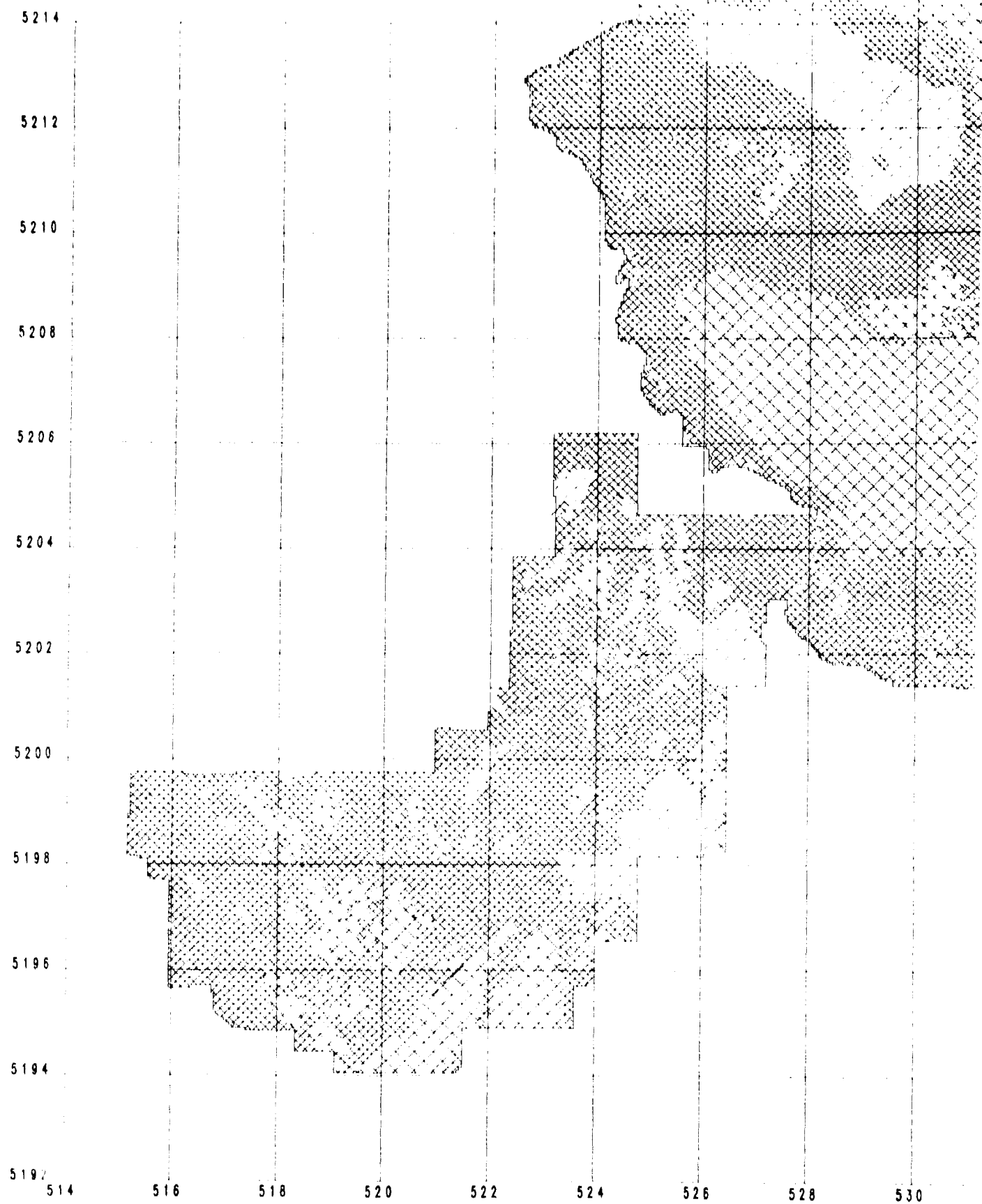
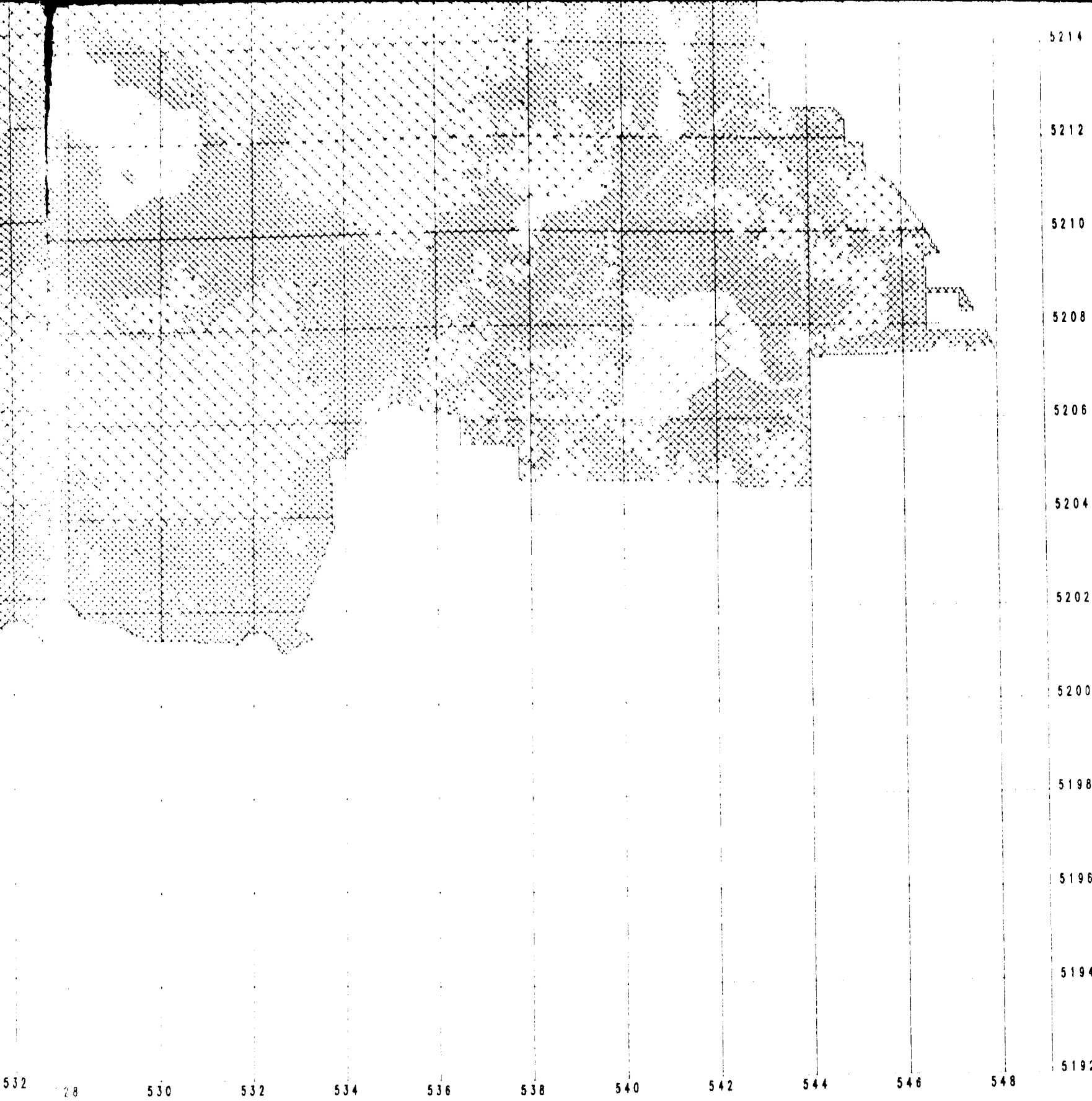
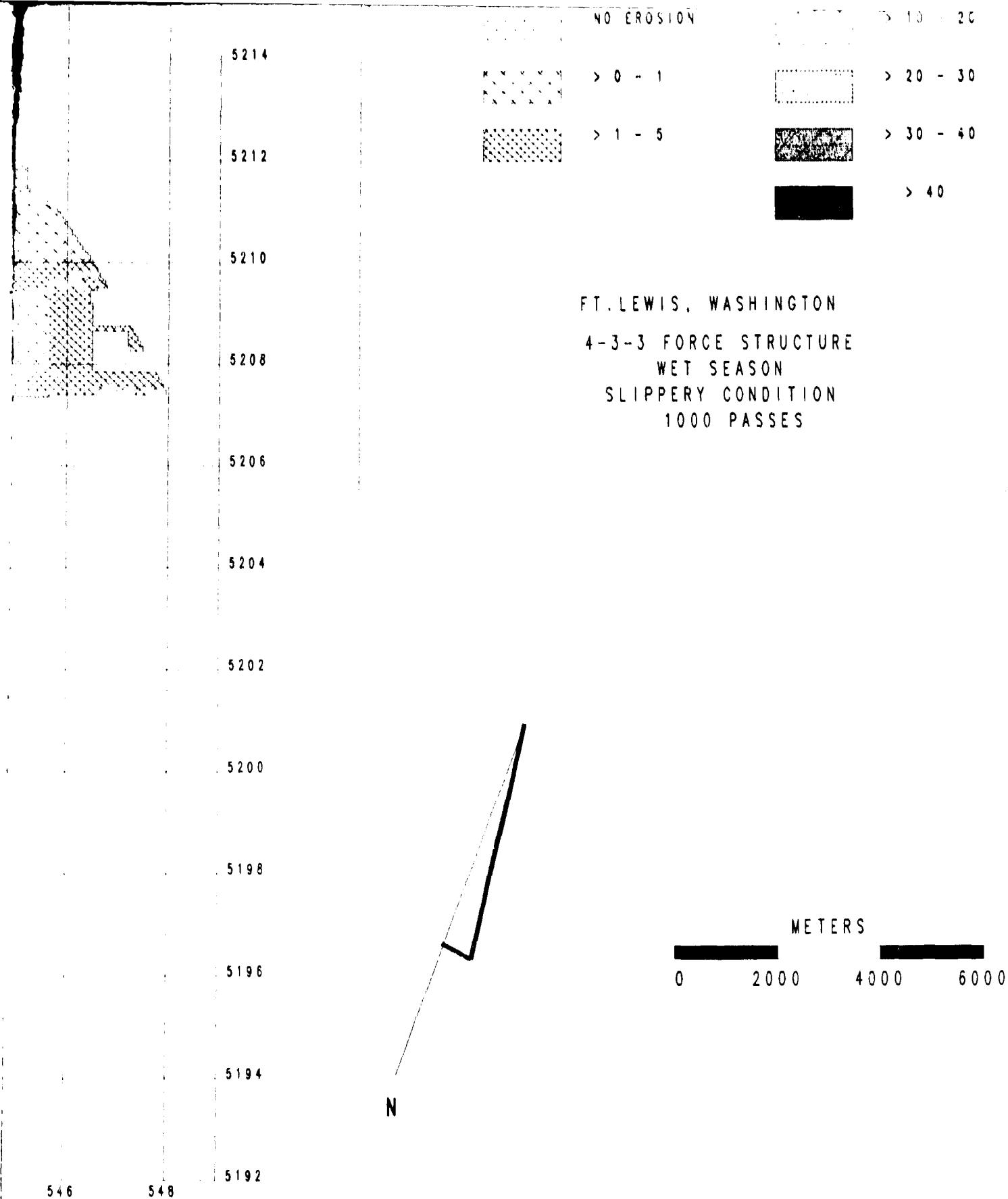


Plate 44. Rate of soil erosion for



the soil erosion for the 4-3-3 (8X8) force structure in the wet slippery surface condition fo



one t surface condition for one thousand passes

514 516 518 520 522 524 526 528 530

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200



532

528

530

532

534

536

538

540

542

544

546

548

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200

546

548

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

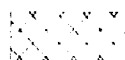
5202

5200

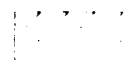


U. S. Army Corps of Engineers
Waterways
Experiment
Station

RATE OF SOIL EROSION
(TONS/ACRE/YEAR)
SCALE 1:100000



URBAN/
OFF LIMITS



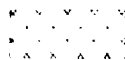
> 5 - 10



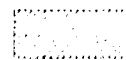
NO EROSION



> 10 - 20



> 0 - 1



> 20 - 30



> 1 - 5



> 30 - 40



> 40

FT. LEWIS, WASHINGTON

5-5-0 FORCE STRUCTURE
DRY SEASON
NORMAL CONDITION
10 PASSES

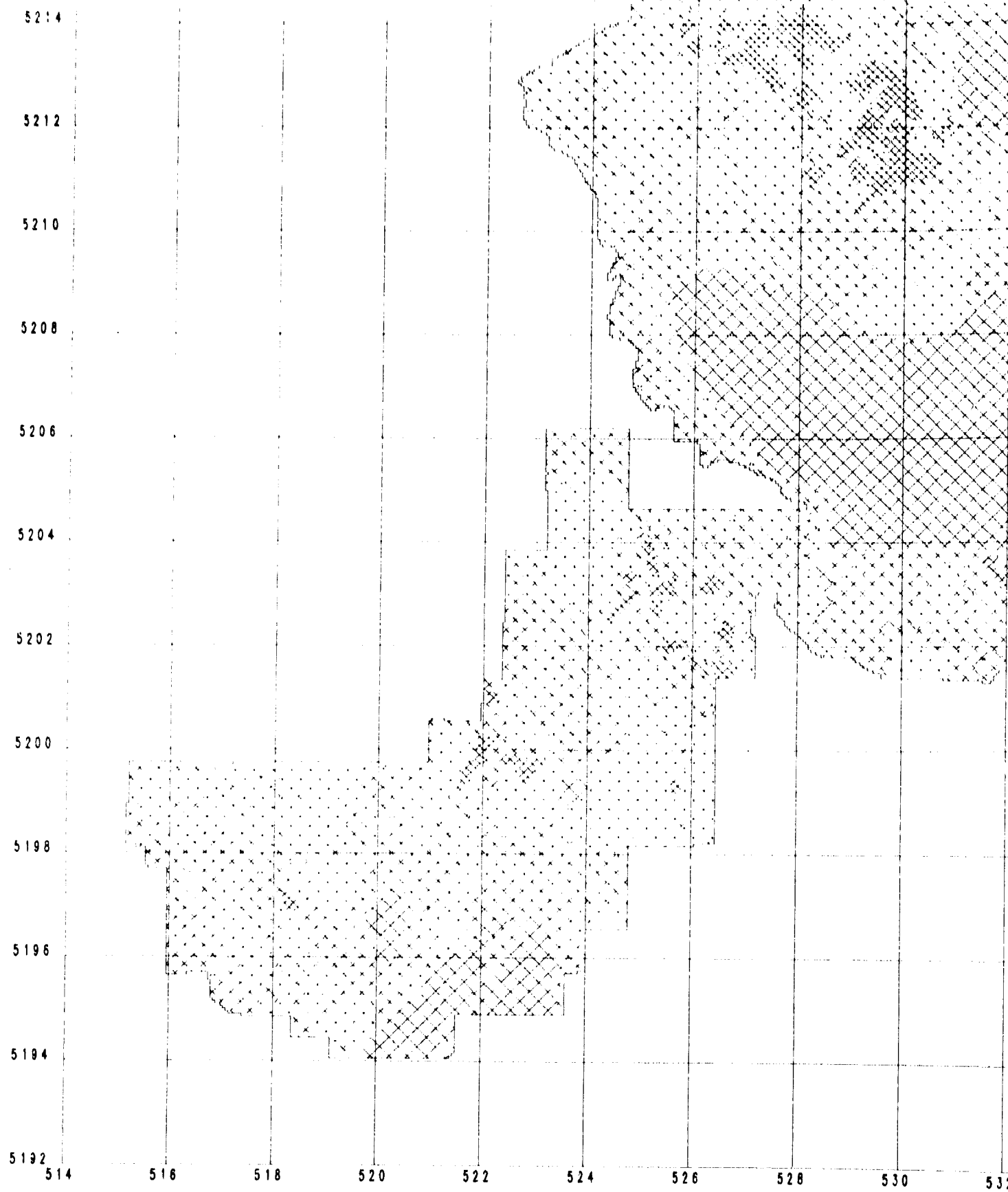
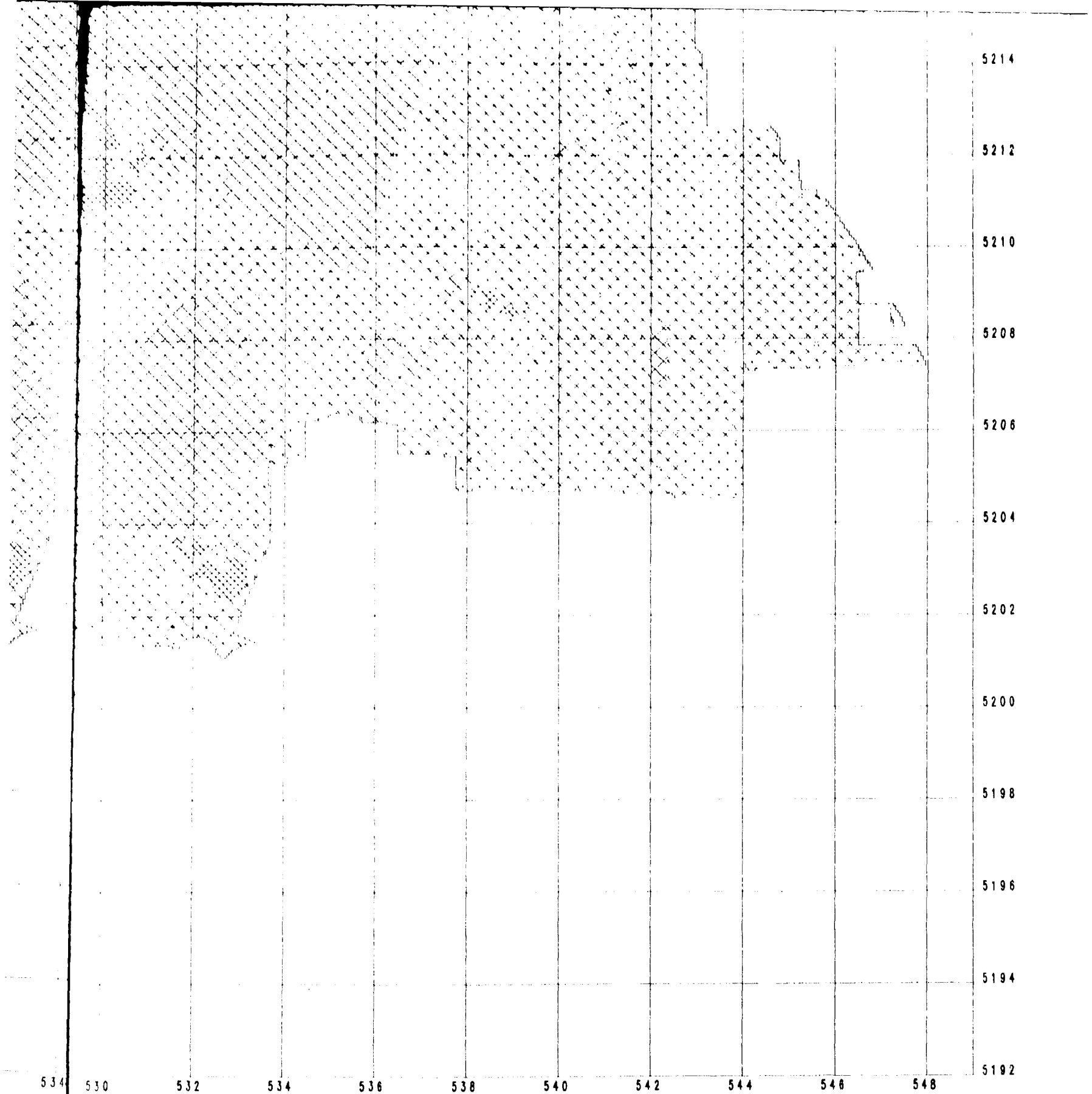


Plate 45. Rate of soil erosion for



the 5- erosion for the 5-5-0 force structure in the dry normal surface condition for ten pa

100

100

100

100

100

100

100

100

100

100

100

100

100

100

100

100

100

100

100

100

100

100

100

N

es condition for test passed

514 516 518 520 522 524 526 528 530 532

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200

5198

528

530

532

534

536

538

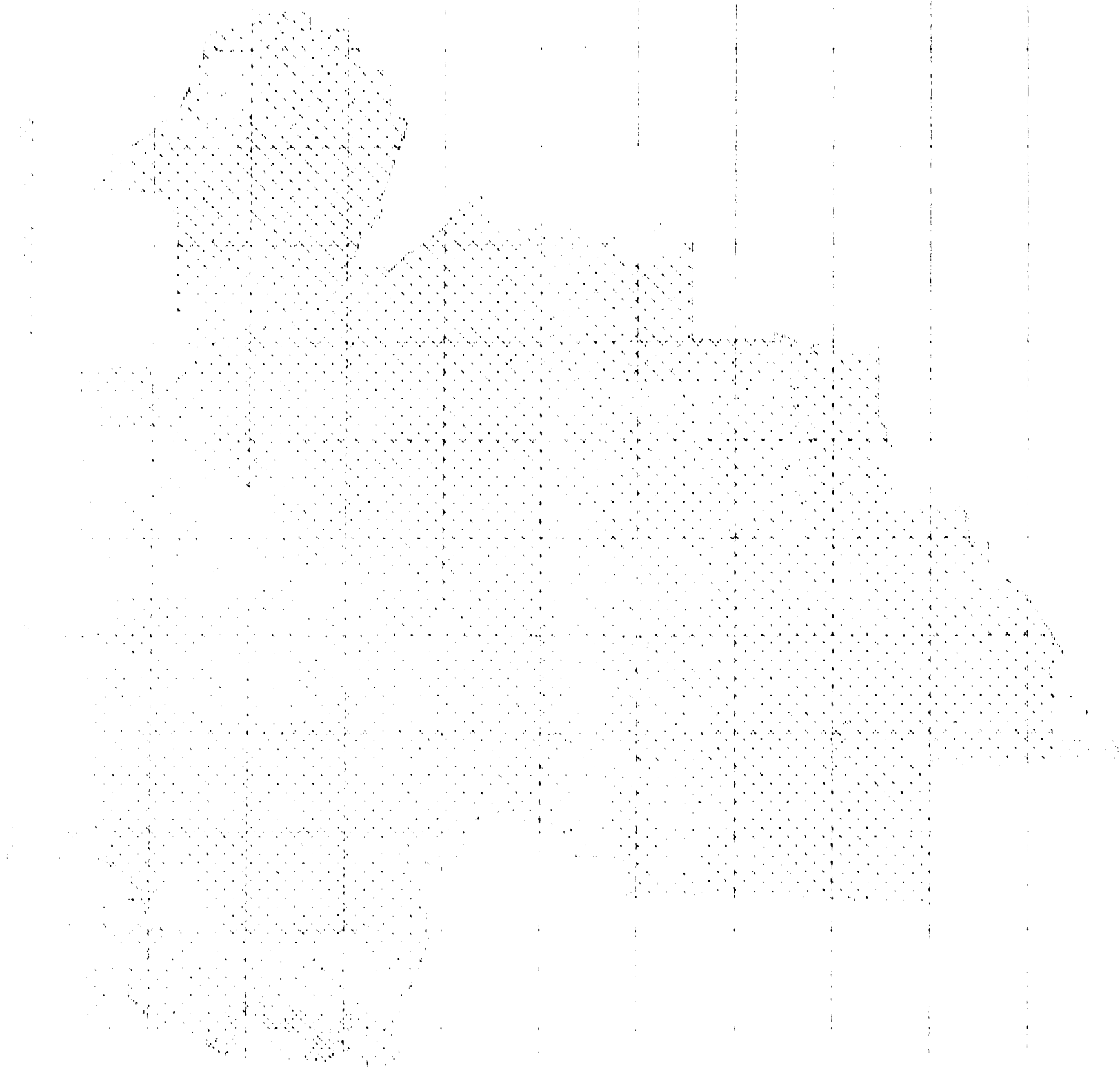
540

542

544

546

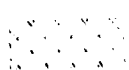
548





U. S. Army Corps of Engineers
Waterways
Experiment
Station

RATE OF SOIL EROSION
(TONS/ACRE/YEAR)
SCALE 1:100000



URBAN/
OFF LIMITS

> 5 - 10



NO EROSION

> 10 - 20



> 0 - 1

> 20 - 30



> 1 - 5

> 30 - 40



> 40



FT. LEWIS, WASHINGTON

D-5-0 FORCE STRUCTURE

DRY SEASON

NORMAL CONDITION

50 PASSES

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200

546

548

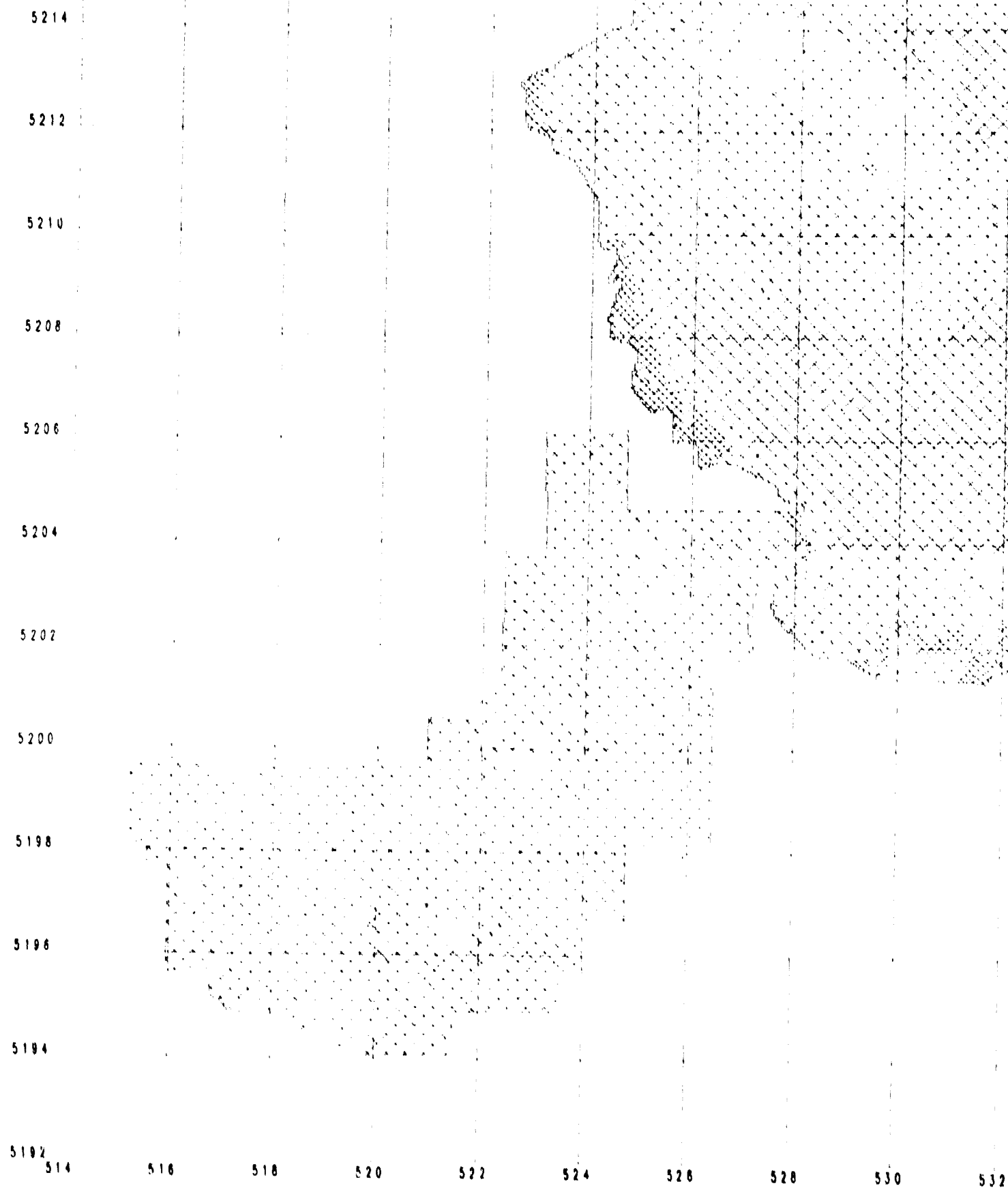


Plate 46. Rate of soil erosion fo

528

530

532

534

536

538

540

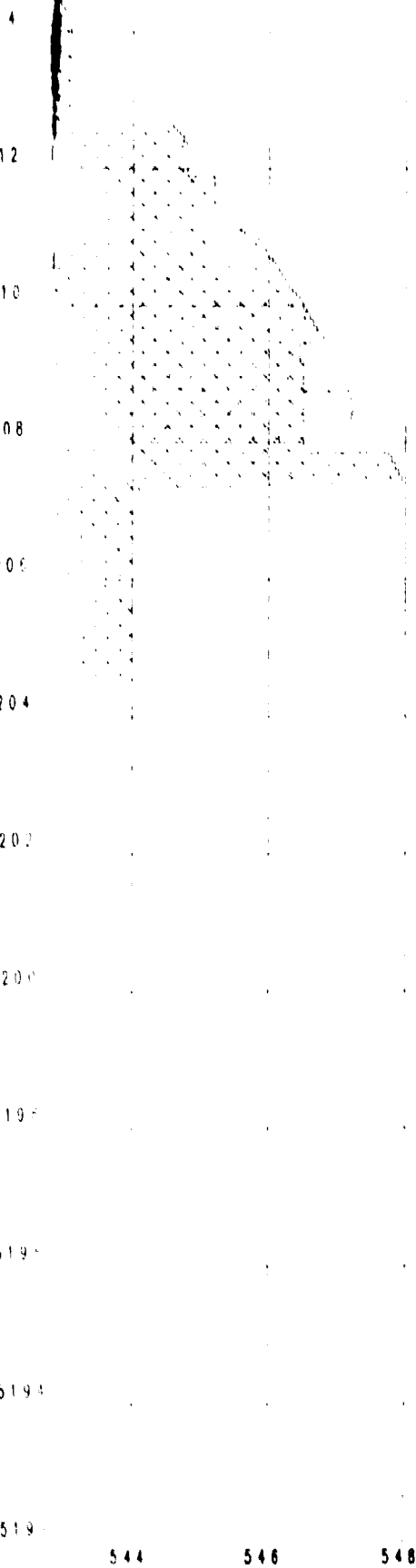
542

544

546

548

Rate of soil erosion for the 5-5-0 force structure in the dry normal surface condition



5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

5194

5192

> 0 - 1

> 1 - 5

> 20 - 30

> 30 - 40

> 40

FT. LEWIS, WASHINGTON

5-5-0 FORCE STRUCTURE

DRY SEASON

NORMAL CONDITION

50 PASSES

METERS

0 2000 4000 6000

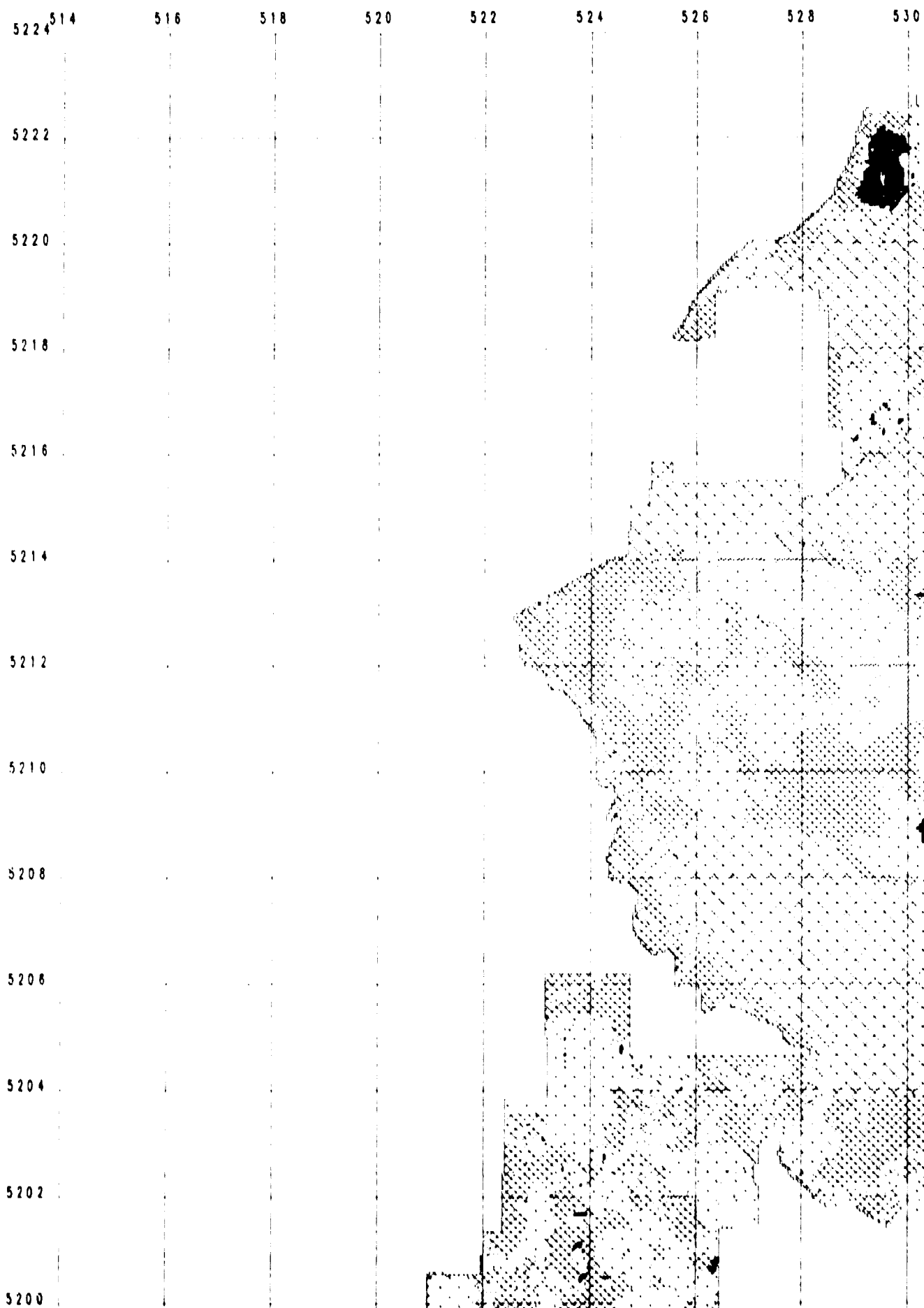
N

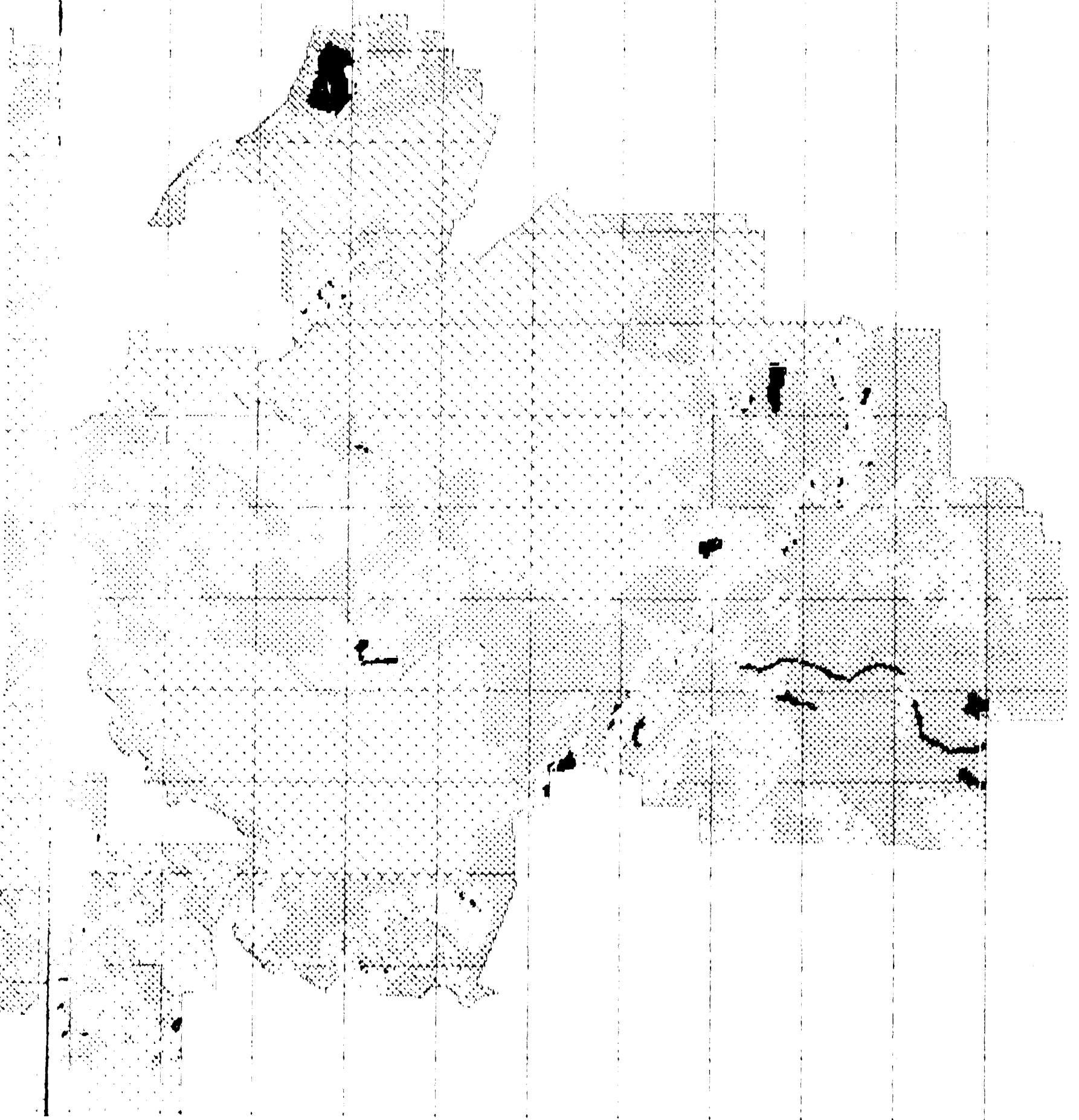
544

546

548

Final surface condition for fifty passes





546

548

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

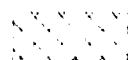
5202

5200



U. S. Army Corps of Engineers
Waterways
Experiment
Station

RATE OF SOIL EROSION
(TONS/ACRE/YEAR)
SCALE 1:100000



URBAN/
OFF LIMITS



NO EROSION



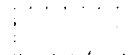
> 0 - 1



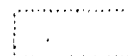
> 1 - 5



> 5 - 10



> 10 - 20



> 20 - 30



> 30 - 40



> 40

FT. LEWIS, WASHINGTON

5-5-0 FORCE STRUCTURE
DRY SEASON
NORMAL CONDITION
1000 PASSES

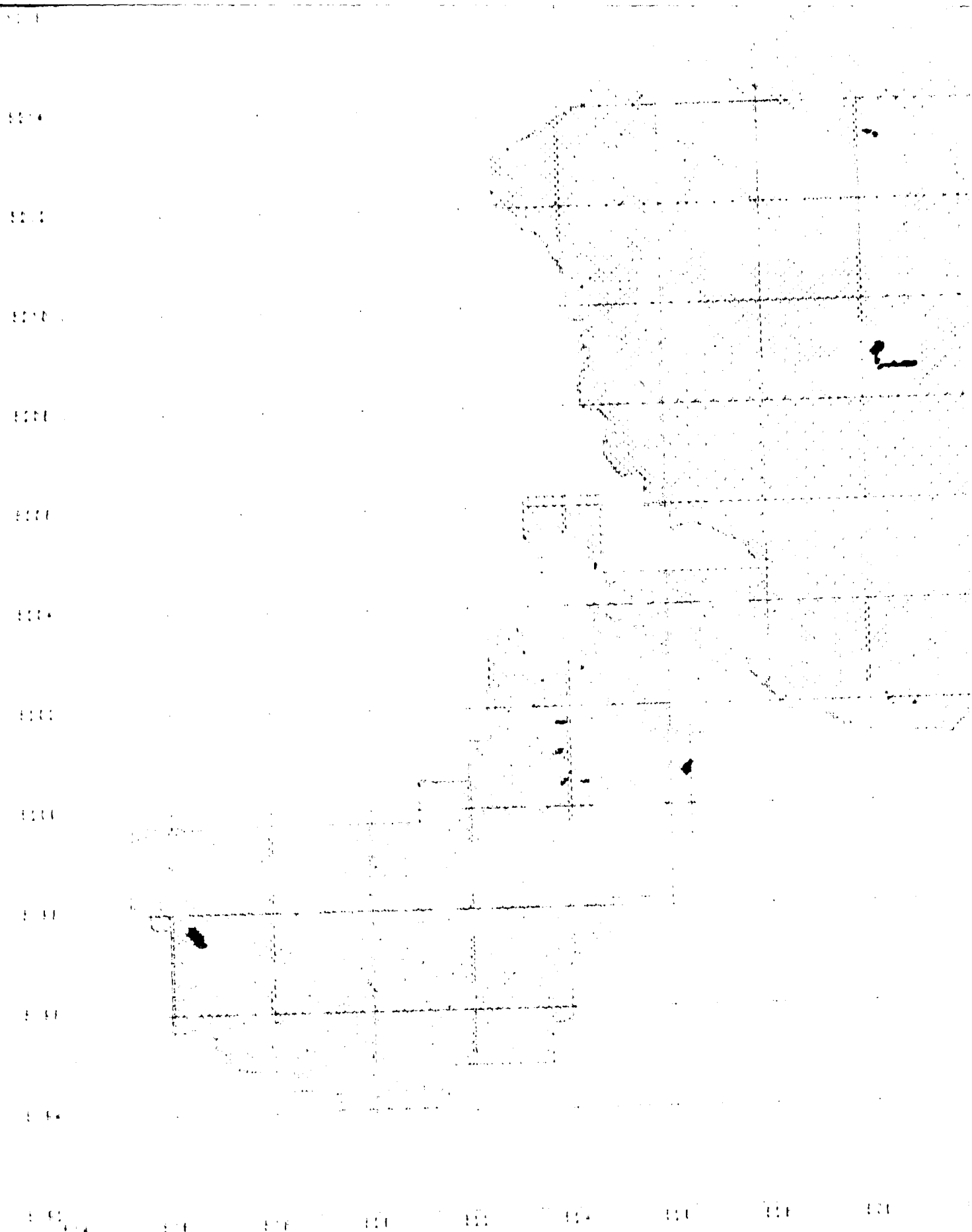
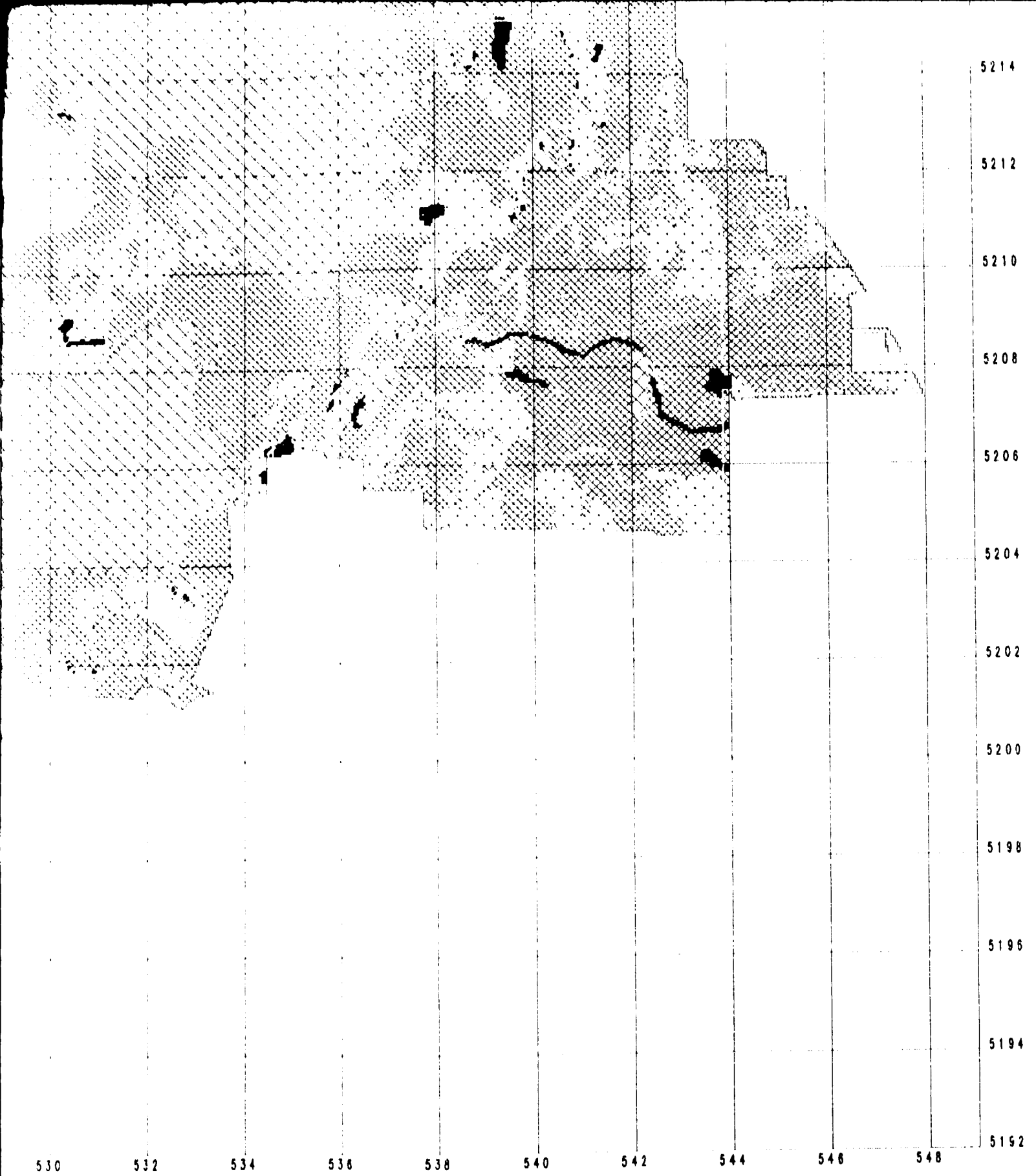


Plate 47. Rate of soil erosion



soil erosion for the 5-5-0 force structure in the dry normal surface condition for one

OFF LIMITS

NO EROSION

> 10 - 20

> 0 - 1

> 20 - 30

> 1 - 5

> 30 - 40

> 40

FT. LEWIS, WASHINGTON

5-5-0 FORCE STRUCTURE

DRY SEASON

NORMAL CONDITION

1000 PASSES

5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

5194

5192

548

METERS

0 2000 4000 6000

N

N

housan

condition for one thousand passes

5224⁵¹⁴

516

518

520

522

524

526

528

530

5222

5220

5218

5216

5214

5212

5210

5208

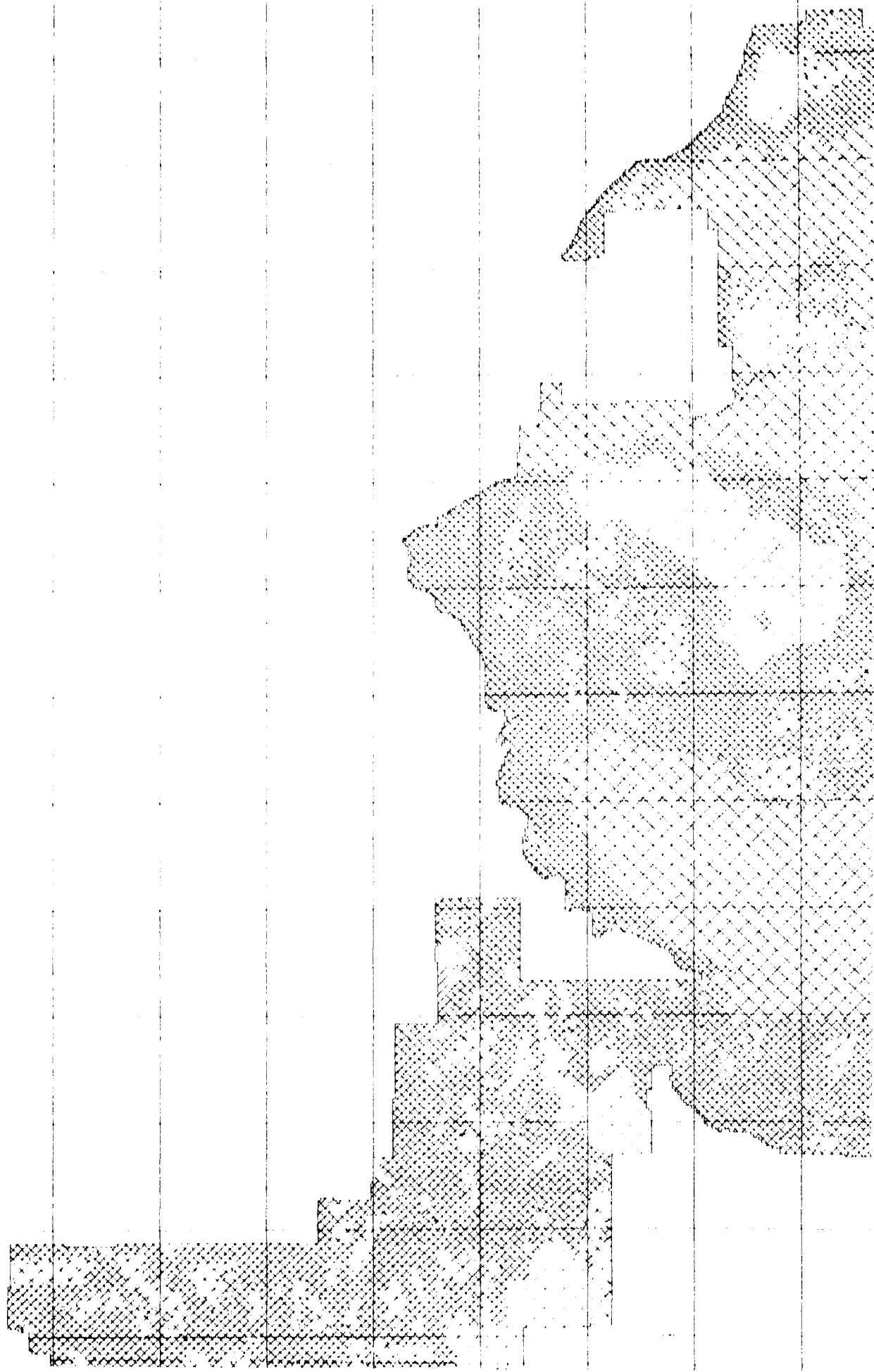
5206

5204

5202

5200

5198



528

530

532

534

536

538

540

542

544

546

548



546

548

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200



U. S. Army Corps of Engineers
Waterways
Experiment
Station

RATE OF SOIL EROSION
(TONS/ACRE/YEAR)
SCALE 1:100000



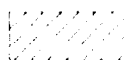
URBAN/
OFF LIMITS



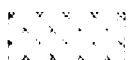
> 5 - 10



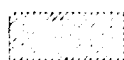
NO EROSION



> 10 - 20



> 0 - 1



> 20 - 30



> 1 - 5



> 30 - 40



> 40

FT. LEWIS, WASHINGTON

5-5-0 FORCE STRUCTURE
WET SEASON
SLIPPERY CONDITION
10 PASSES

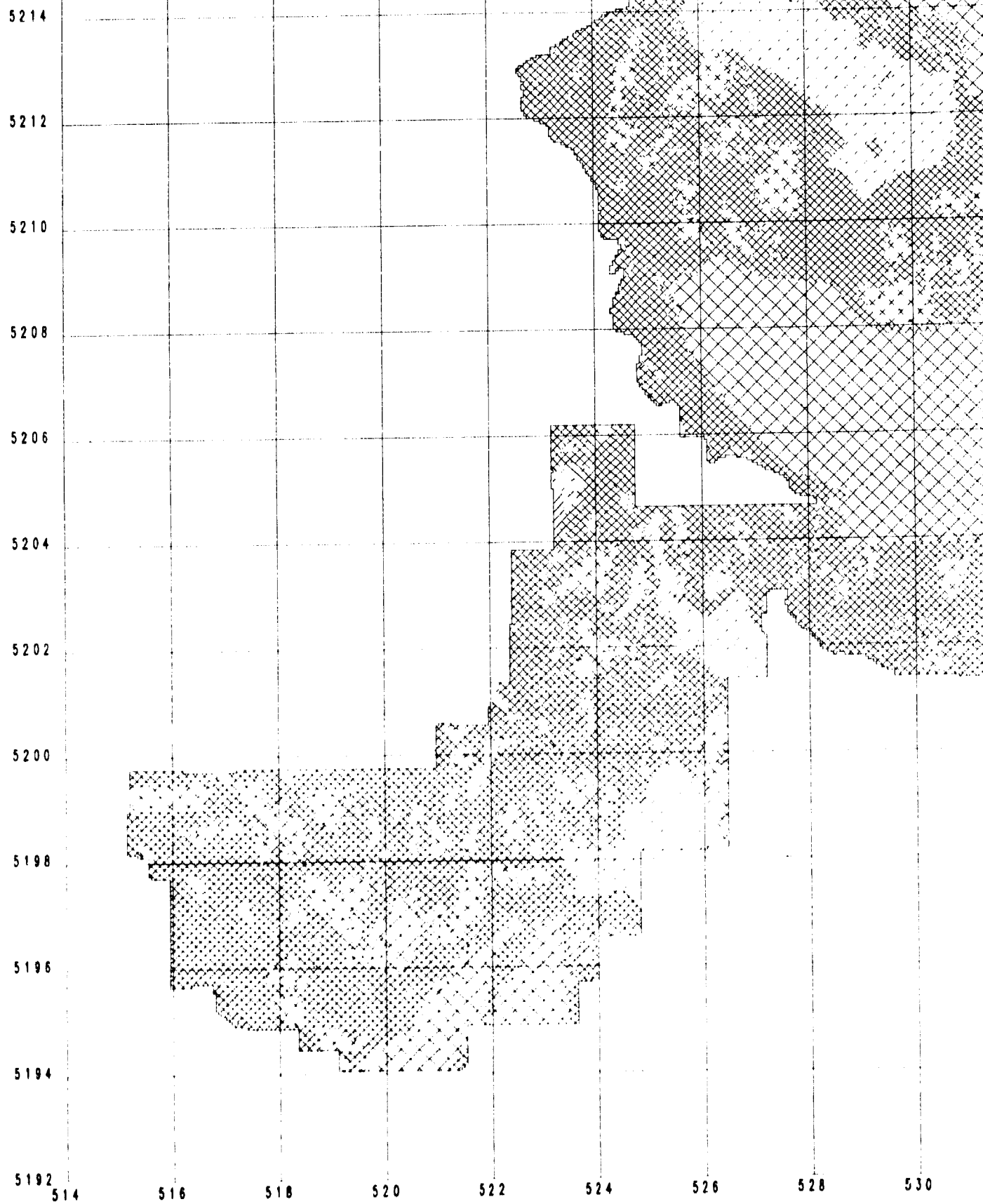
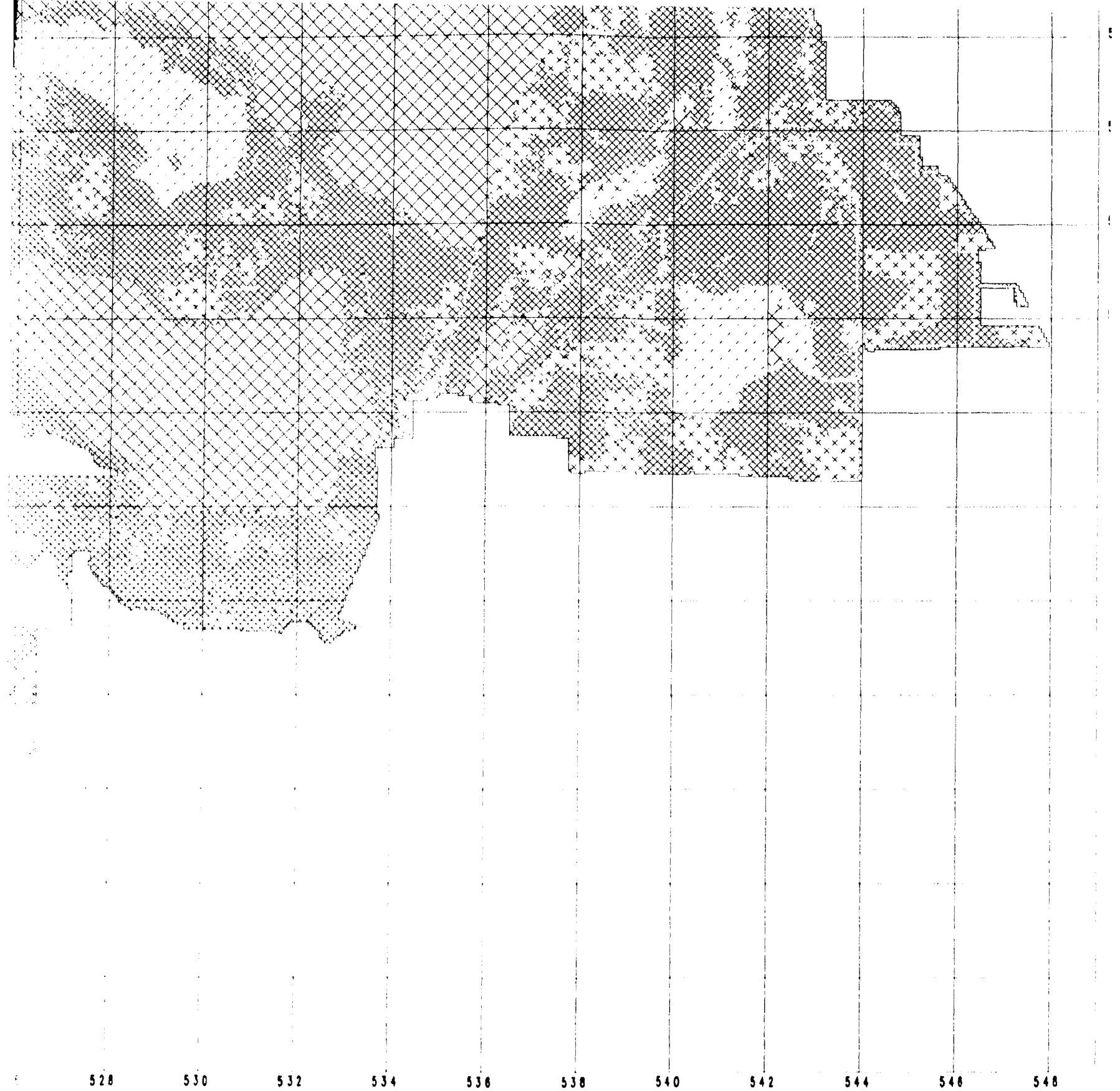
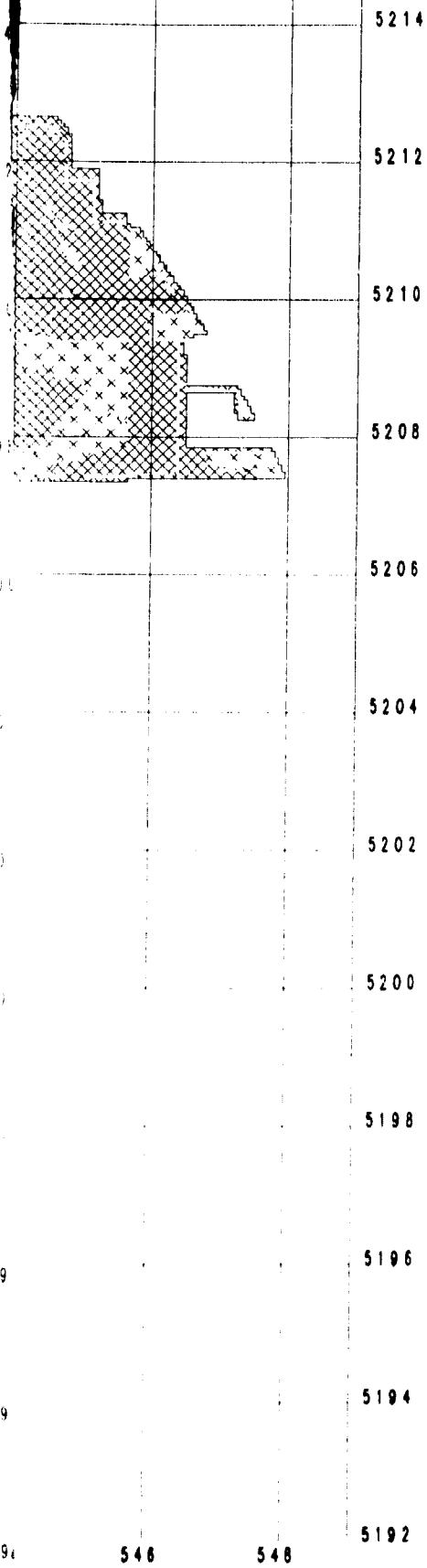


plate 48. Rate of soil erosion 1

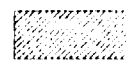


Rate of soil erosion for the 5-5-0 force structure in the wet slippery surface condition for



> 0 - 1

> 1 - 5



> 20 - 30

> 30 - 40

> 40

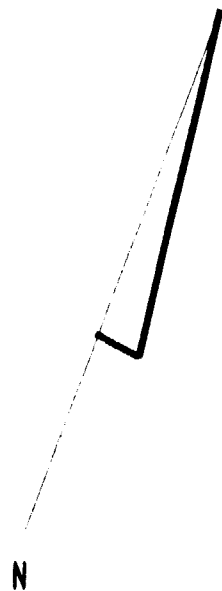
FT. LEWIS, WASHINGTON

5-5-0 FORCE STRUCTURE

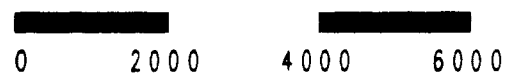
WET SEASON

SLIPPERY CONDITION

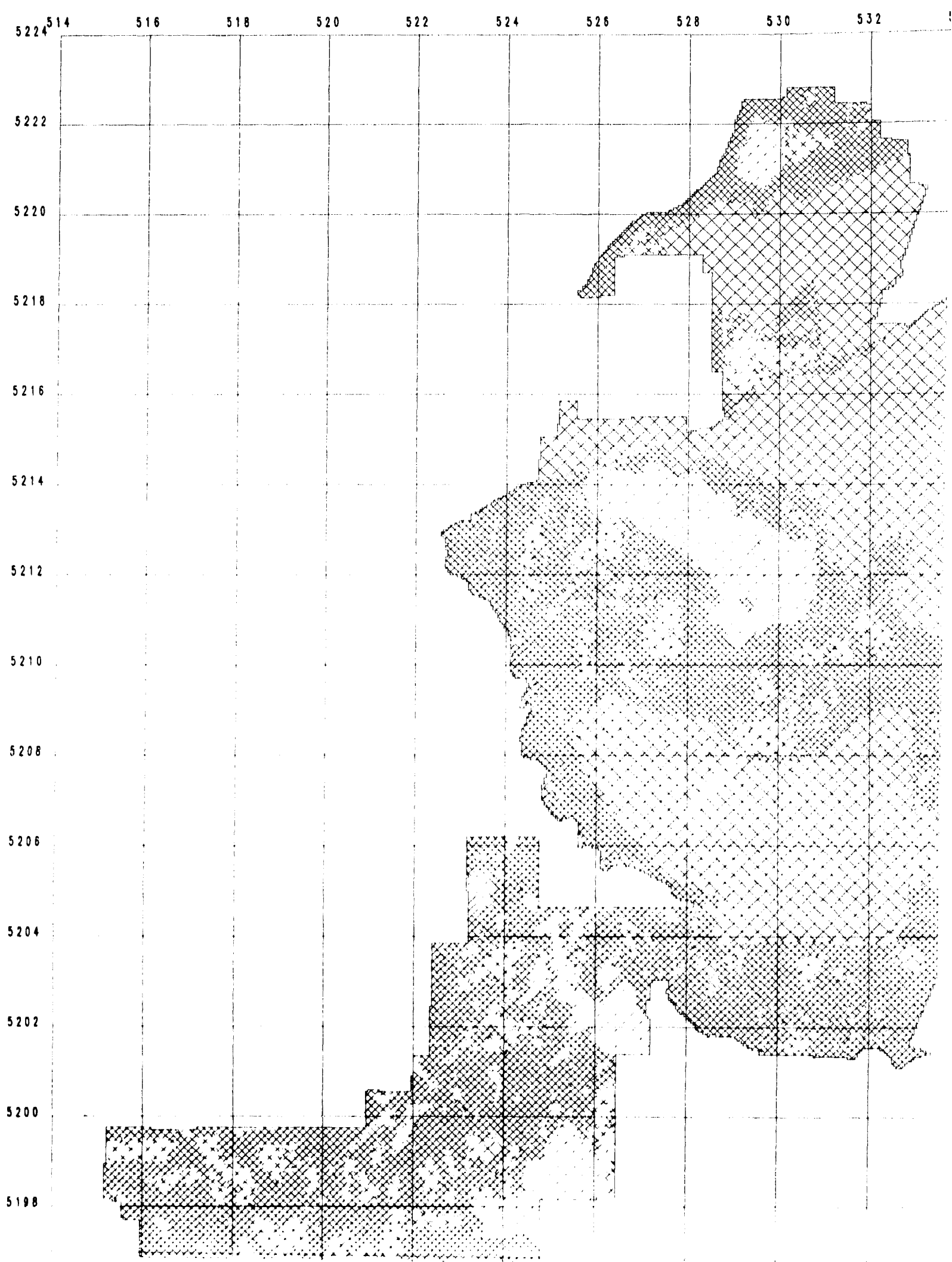
10 PASSES



METERS



Surface condition for ten passes



528

530

532

534

536

538

540

542

544

546

548

5

5

5

5

5

5

5

5

5

5

5

5

5



546

548

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200

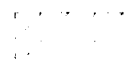


U. S. Army Corps of Engineers
Waterways
Experiment
Station

RATE OF SOIL EROSION
(TONS/ACRE/YEAR)
SCALE 1:100000



URBAN/
OFF LIMITS



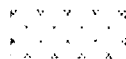
> 5 - 10



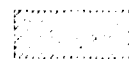
NO EROSION



> 10 - 20



> 0 - 1



> 20 - 30



> 1 - 5



> 30 - 40



> 40

FT. LEWIS, WASHINGTON

5-5-0 FORCE STRUCTURE

WET SEASON

SLIPPERY CONDITION

50 PASSES

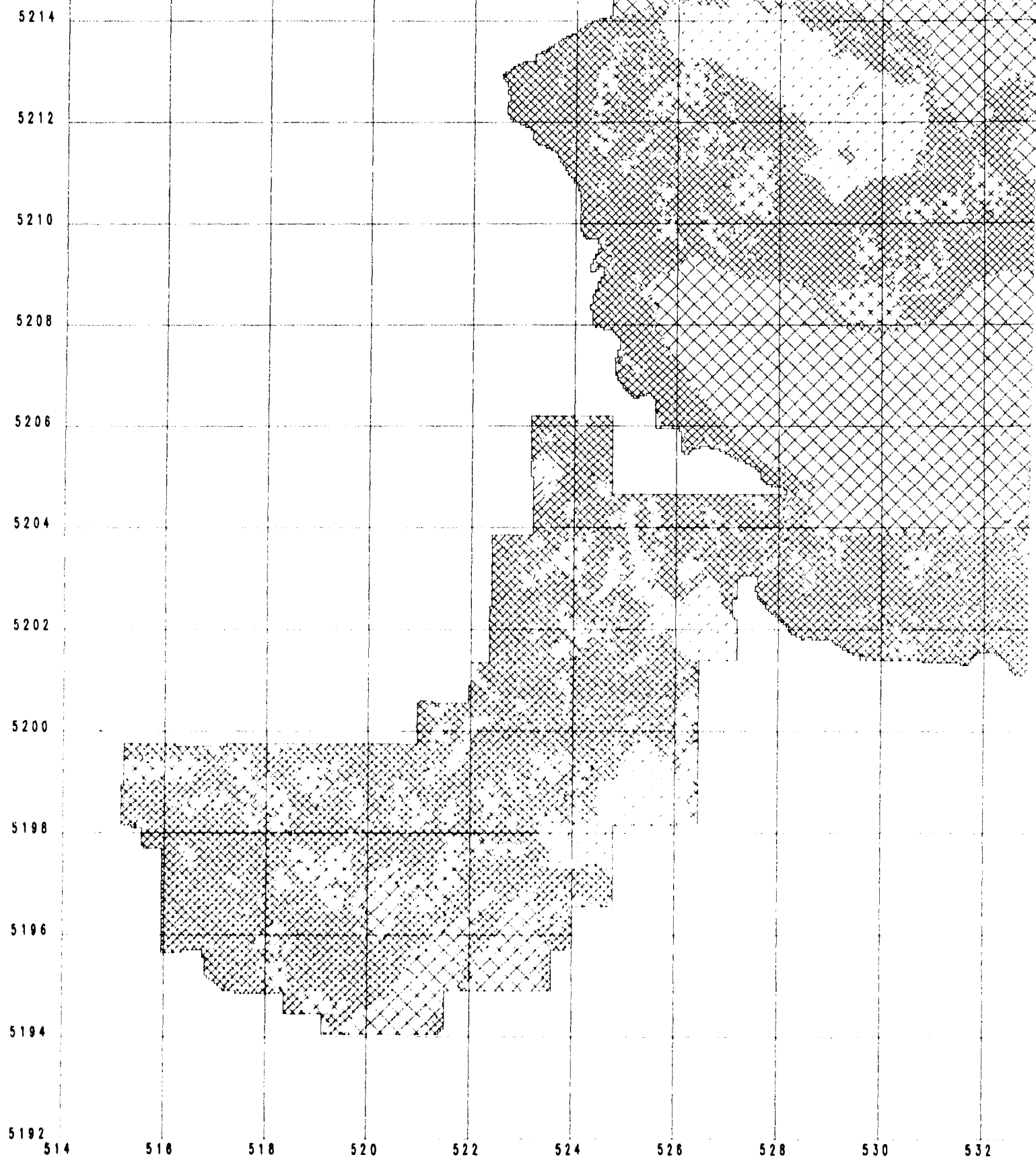
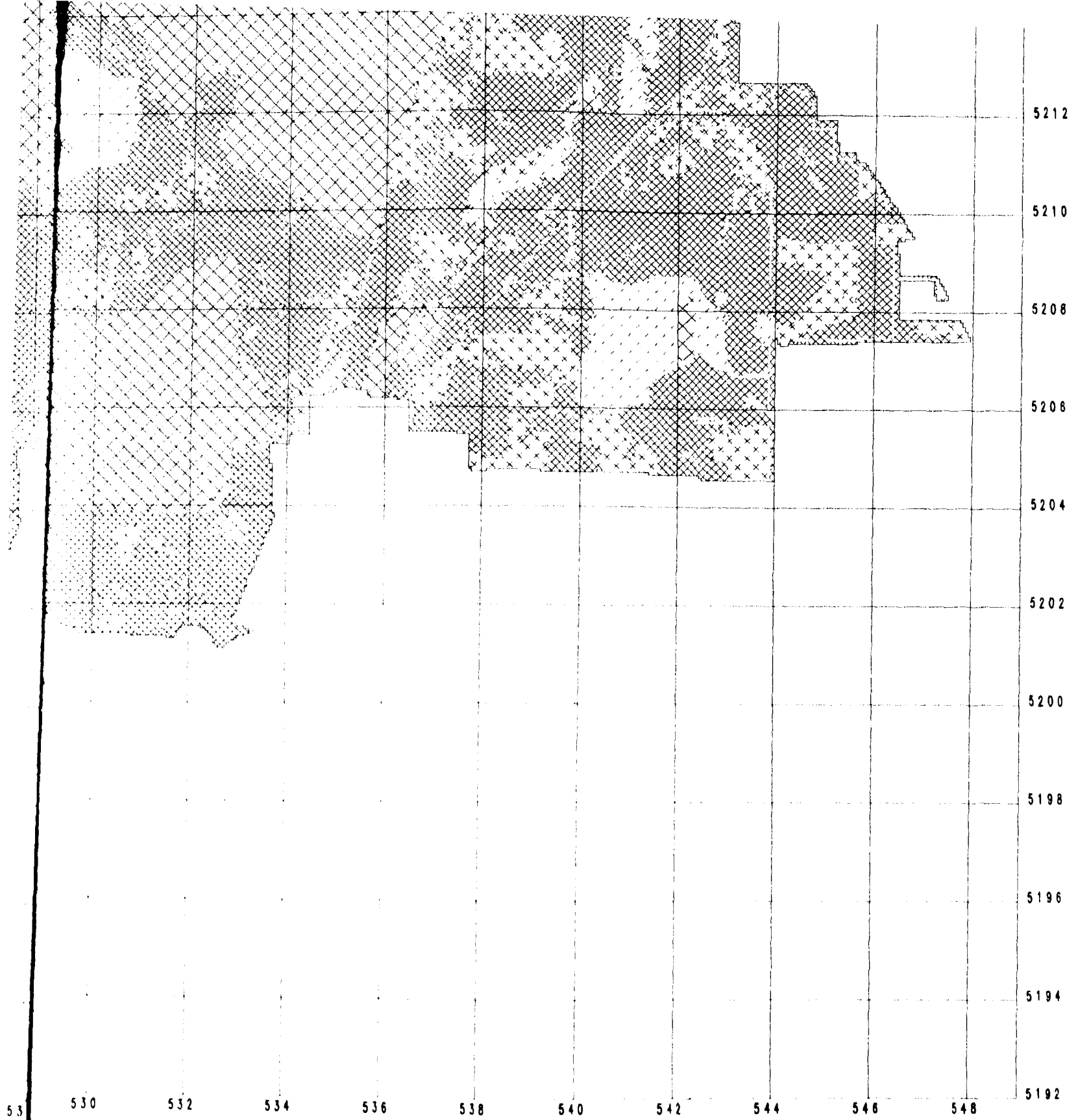
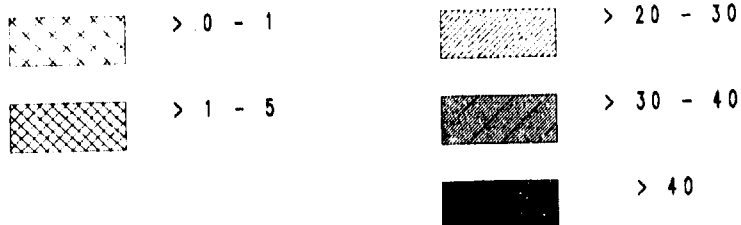
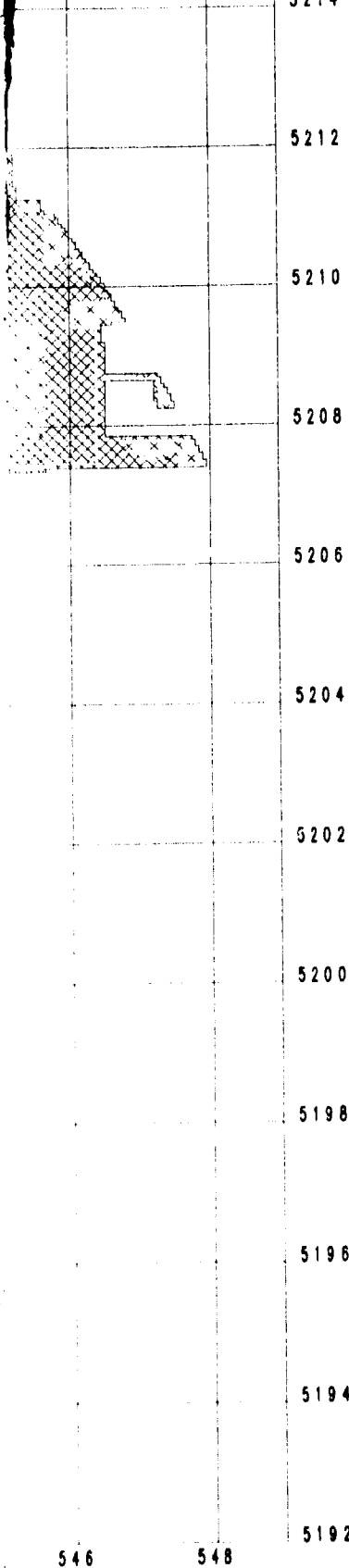


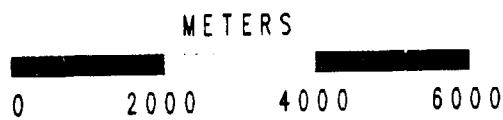
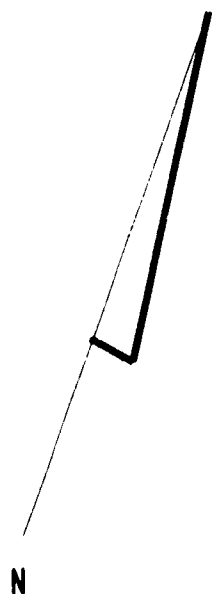
Plate 49. Rate of soil erosion for t



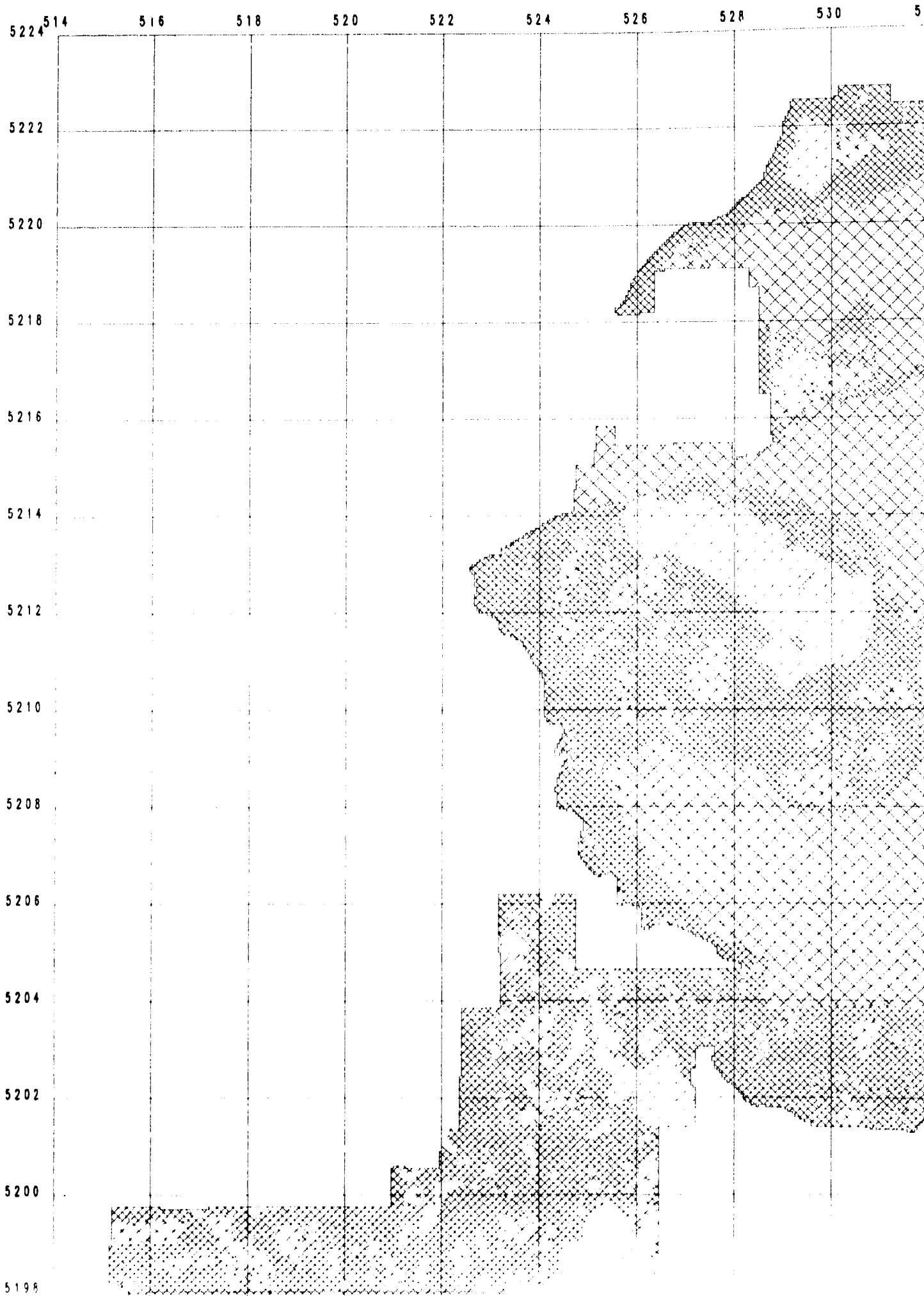
5-11 erosion for the 5-5-0 force structure in the wet slippery surface condition for fifty pa



FT. LEWIS, WASHINGTON
5-5-0 FORCE STRUCTURE
WET SEASON
SLIPPERY CONDITION
50 PASSES



face condition for fifty passes



528

530

532

534

536

538

540

542

544

546

548

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200

519

540

540

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

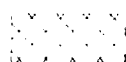
5202

5200

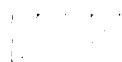


U. S. Army Corps of Engineers
Waterways
Experiment
Station

RATE OF SOIL EROSION
(TONS/ACRE/YEAR)
SCALE 1:100000



URBAN/
OFF LIMITS



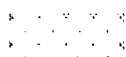
> 5 - 10



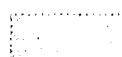
NO EROSION



> 10 - 20



> 0 - 1



> 20 - 30



> 1 - 5



> 30 - 40



> 40

FT. LEWIS, WASHINGTON

5-5-0 FORCE STRUCTURE

WET SEASON

SLIPPERY CONDITION

1000 PASSES

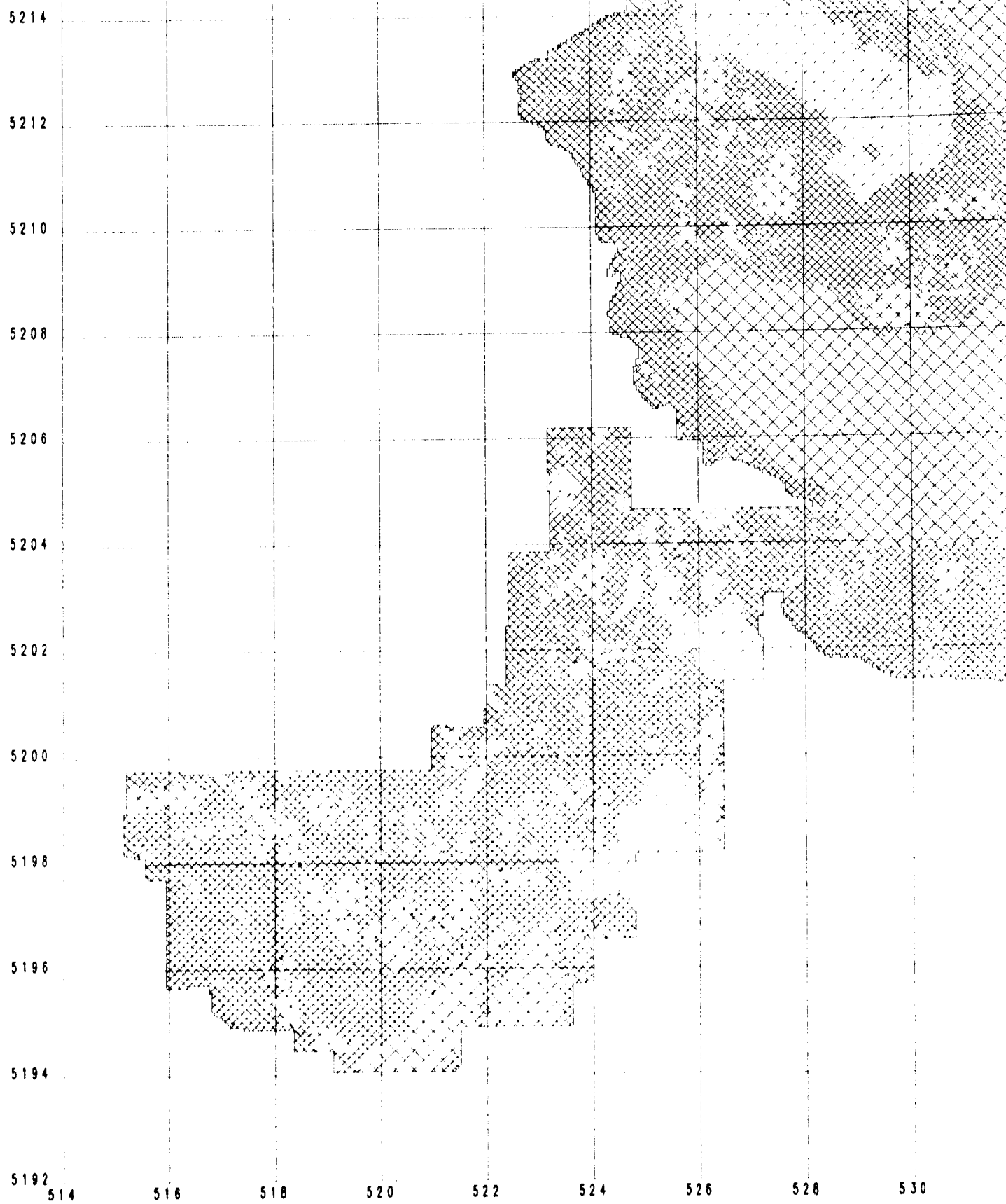
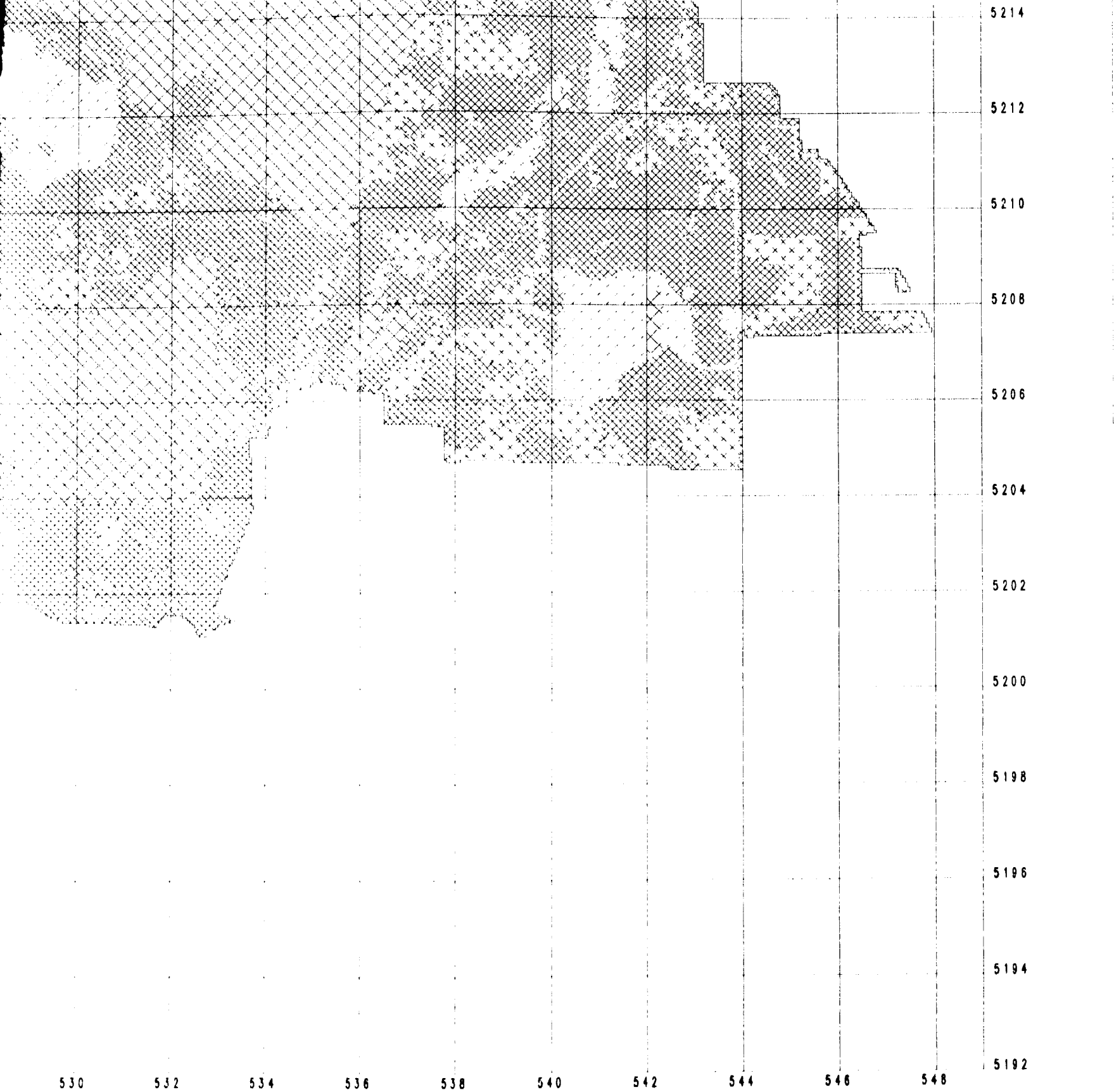
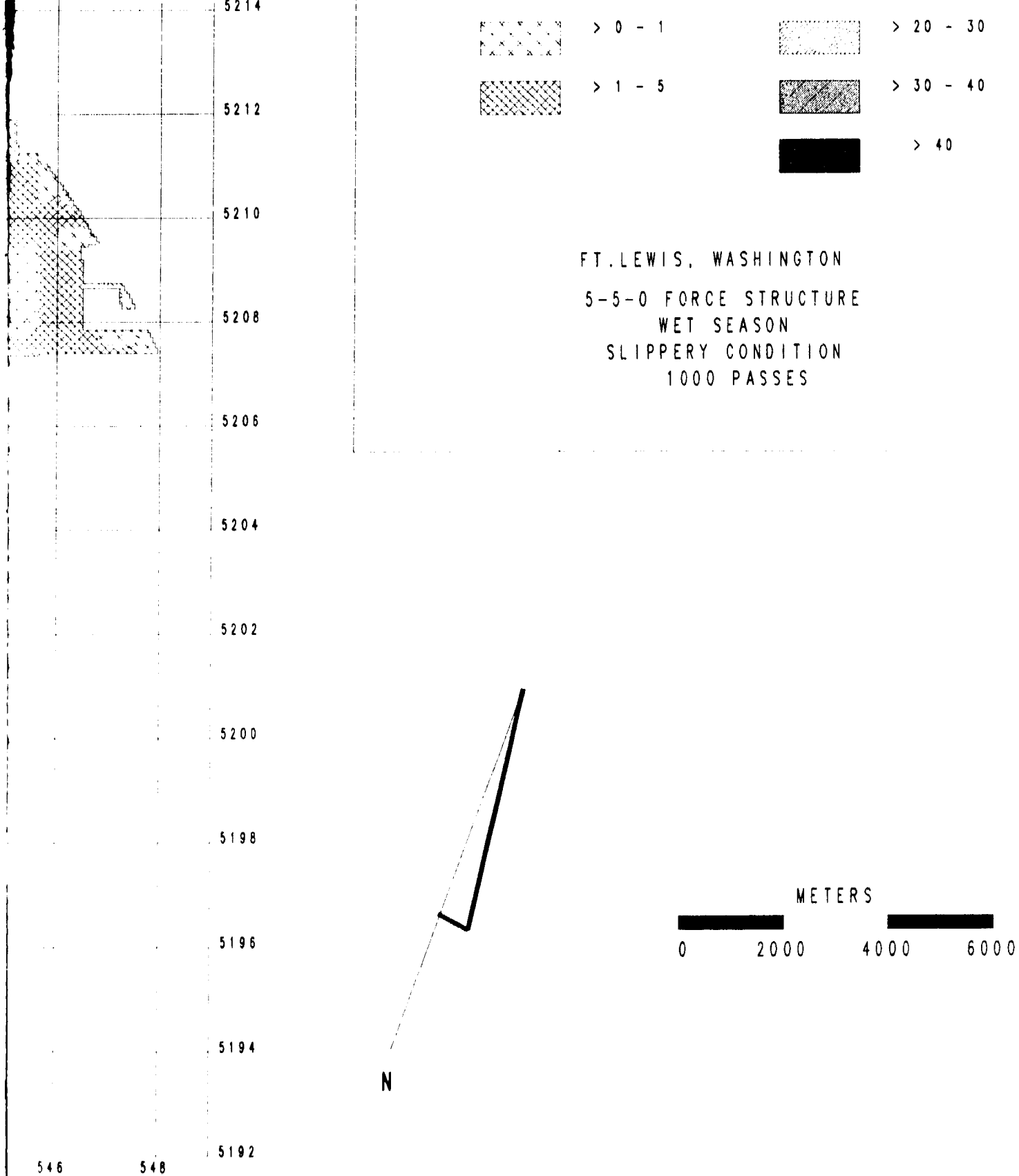


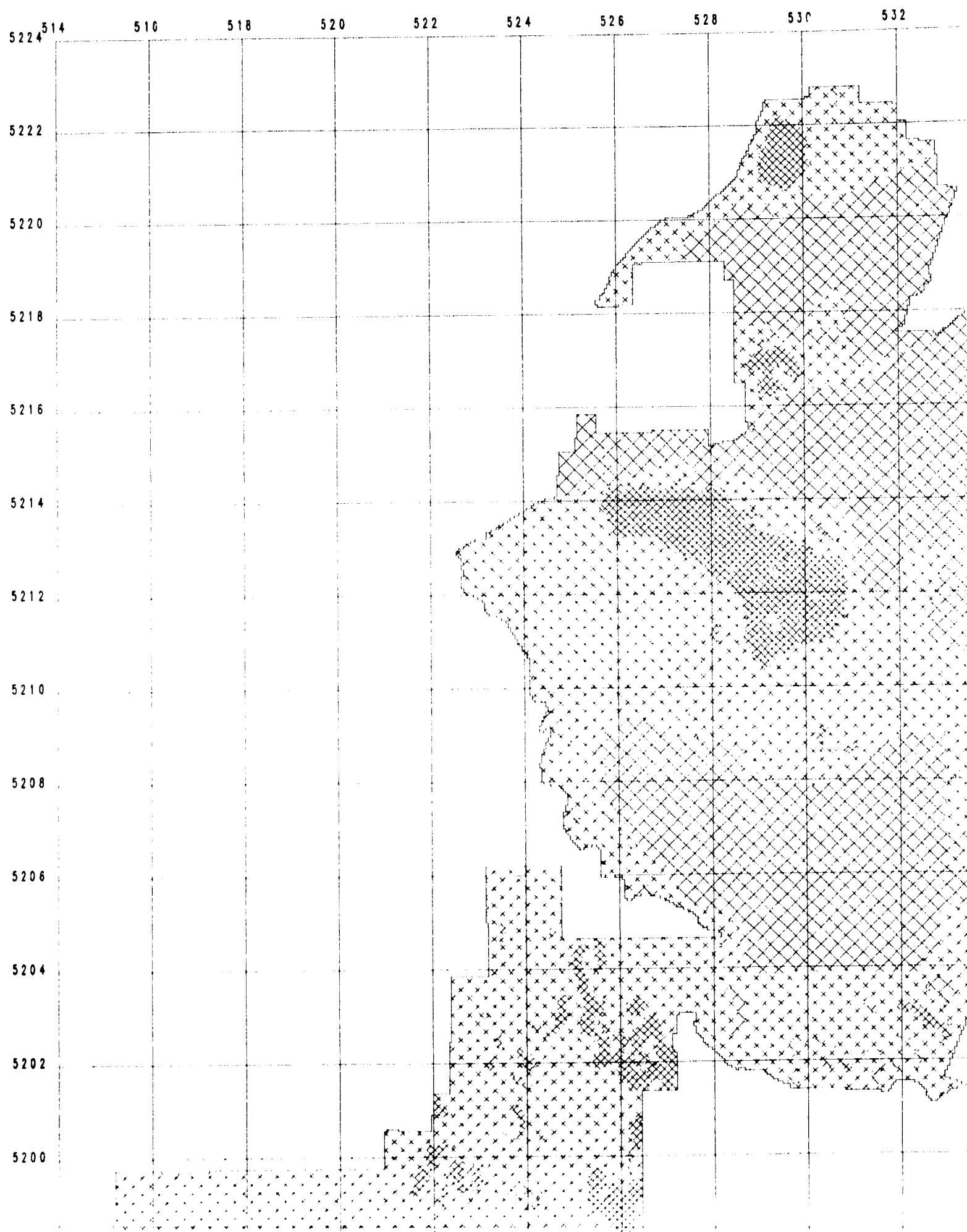
Plate 50. Rate of soil erosion for



erosion for the 5-5-0 force structure in the wet slippery surface condition for one thousand



condition for one thousand passes



528

530

532

534

536

538

540

542

544

546

548

5224

5222

5220

5218

5216

5214

5212

5210

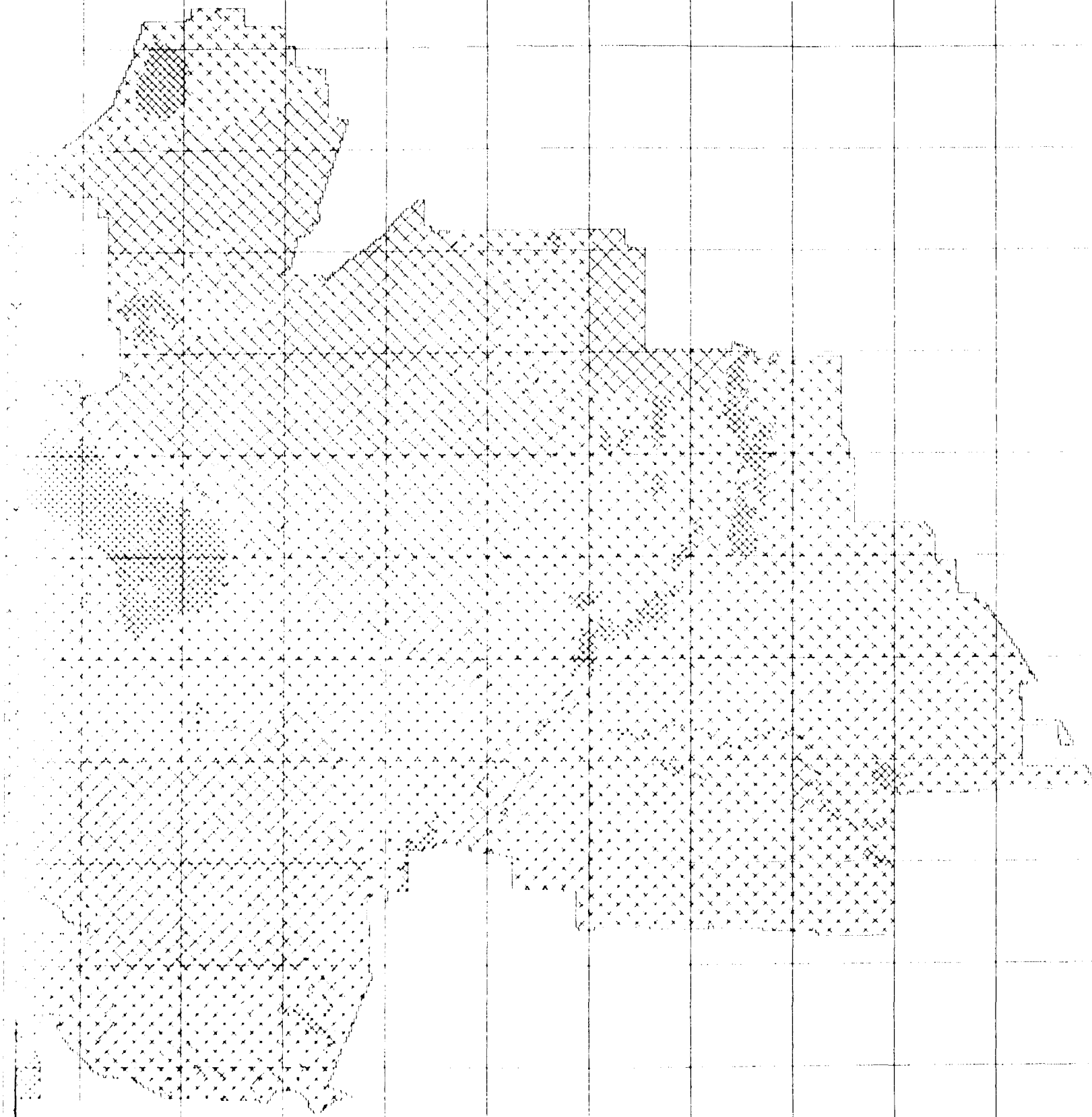
520

520

520

520

520



548

548

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200

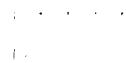


U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL EROSION SEVERITY
TOTAL POSSIBLE EROSION / SOIL GENERATION RATE
SCALE 1:100000



URBAN/
OFF LIMITS



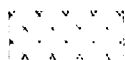
> 5 - 10



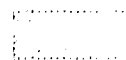
NO EROSION



> 10 - 20



> 0 - 1



> 20 - 30



> 1 - 5



> 30 - 40



> 40

FT. LEWIS, WASHINGTON

3-3-5 FORCE STRUCTURE
10 PASSES

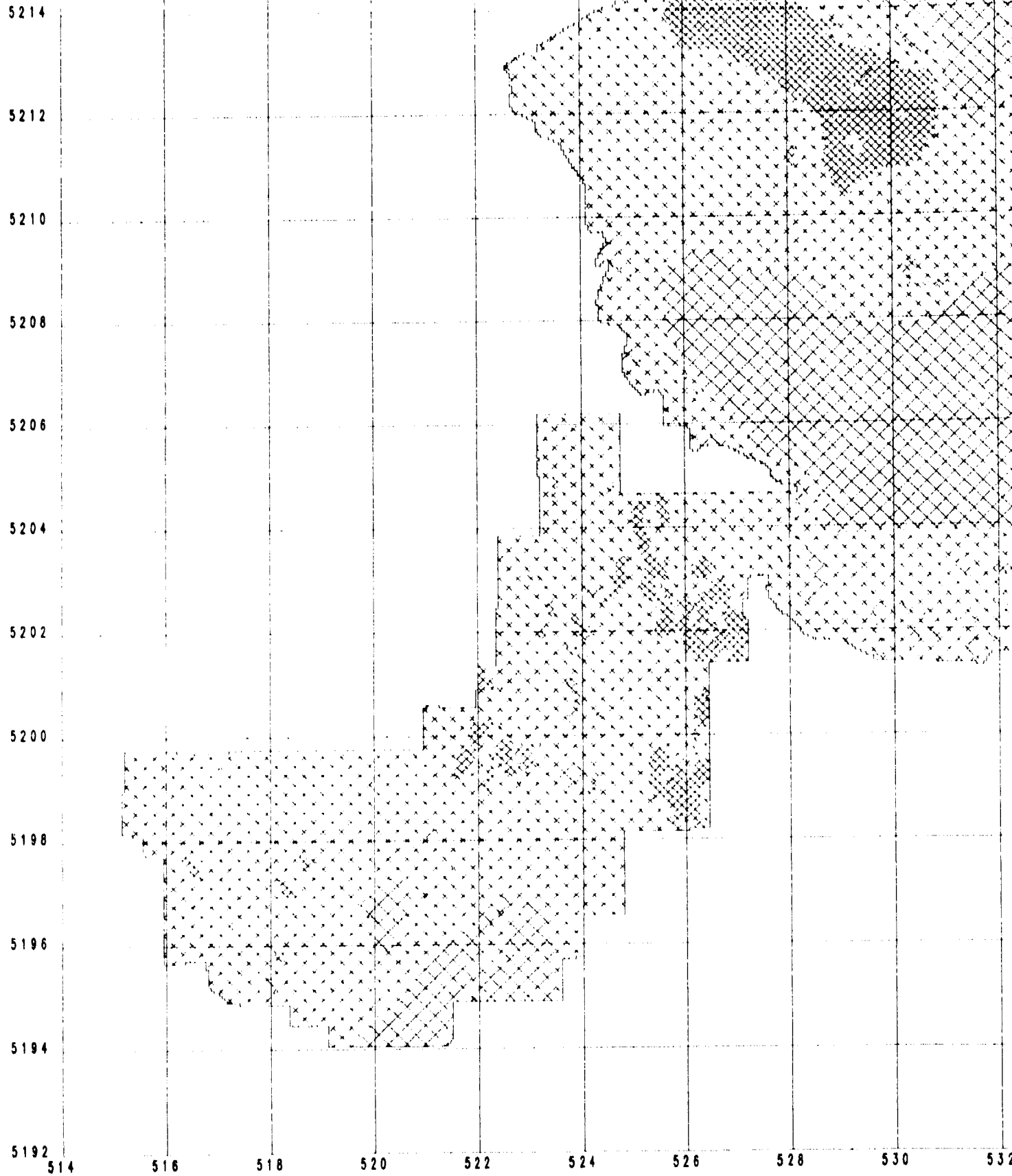


Plate 51. Soil erosion

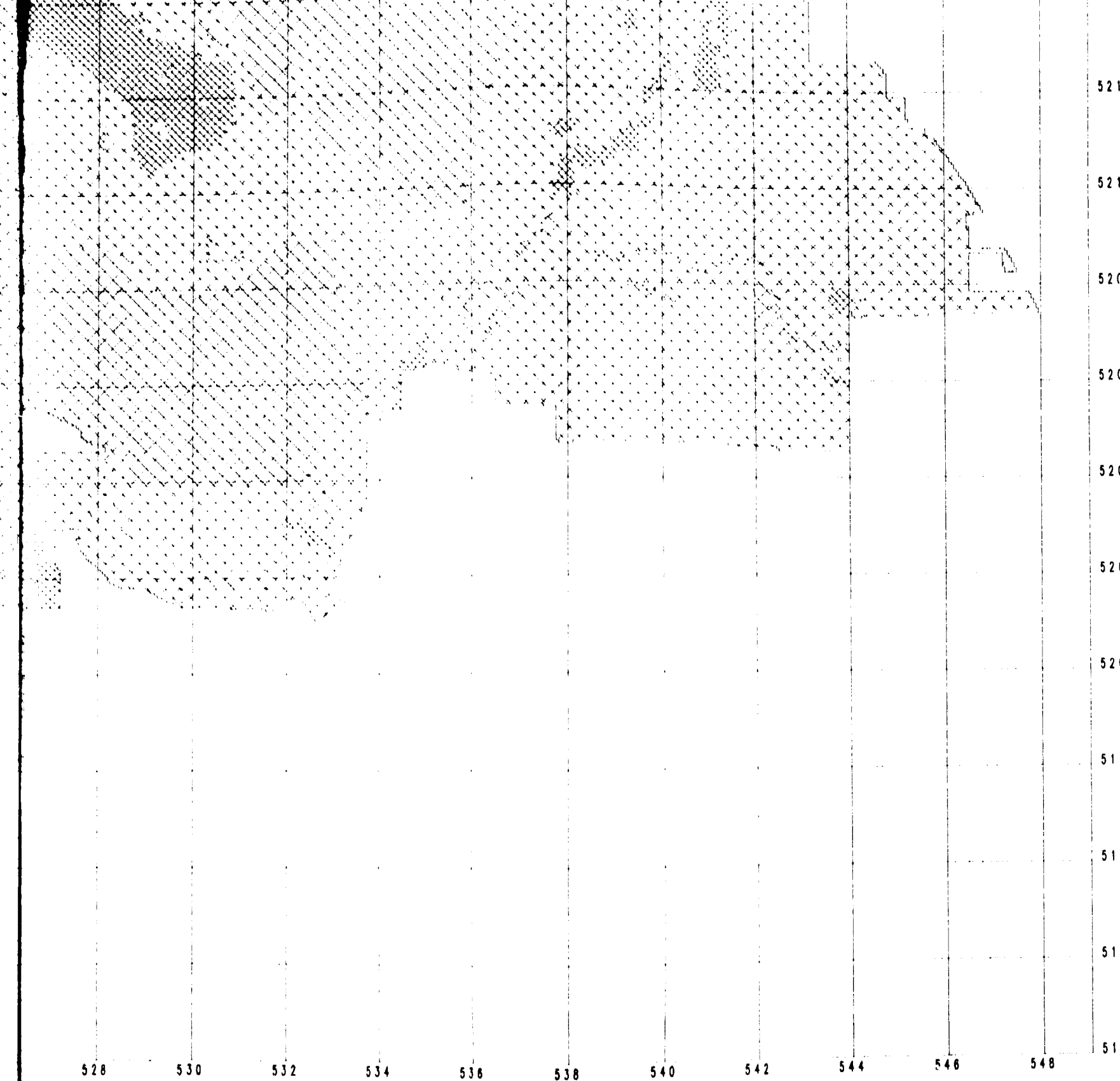
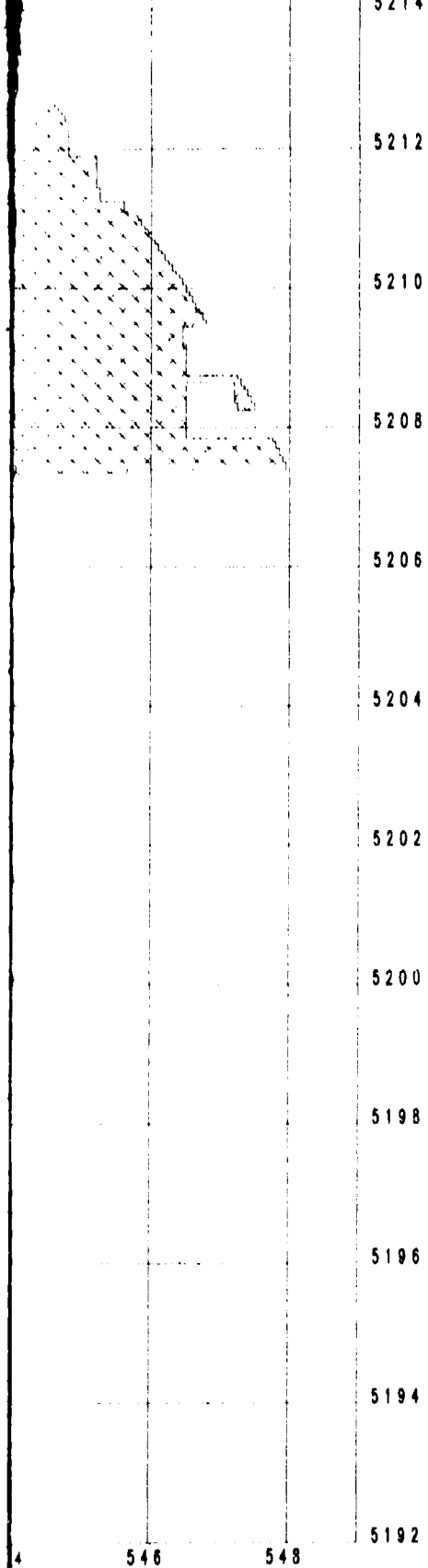
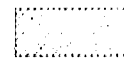


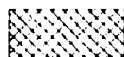
Plate 51. Soil erosion severity for 3-3-5 and 4-3-3 (HMMWV) force structures for ten pass



> 0 - 1



> 20 - 30



> 1 - 5



> 30 - 40

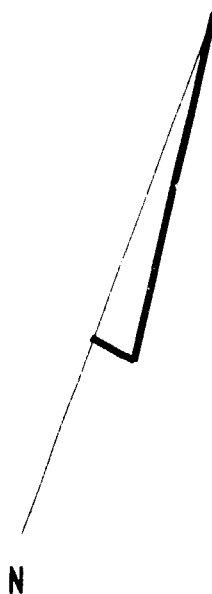


> 40

FT. LEWIS, WASHINGTON

3-3-5 FORCE STRUCTURE

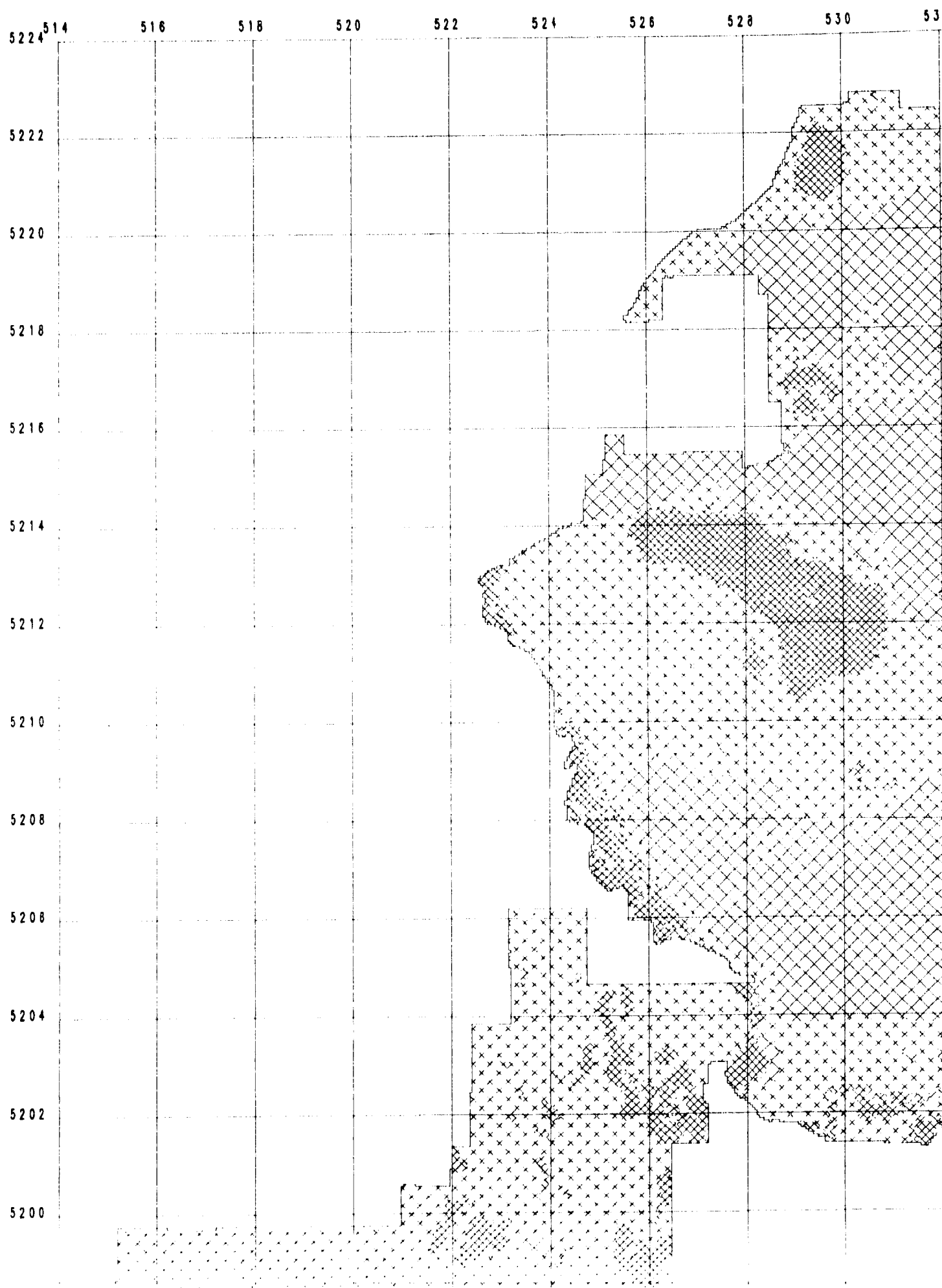
10 PASSES



METERS



structures for ten passes



528

530

532

534

536

538

540

542

544

546

548



546

548

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

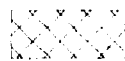
5200

5198



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL EROSION SEVERITY
TOTAL POSSIBLE EROSION / SOIL GENERATION RATE
SCALE 1:100000



URBAN/
OFF LIMITS



NO EROSION



> 0 - 1



> 1 - 5



> 5 - 10



> 10 - 20



> 20 - 30



> 30 - 40



> 40

FT. LEWIS, WASHINGTON

3-3-5 FORCE STRUCTURE
50 PASSES

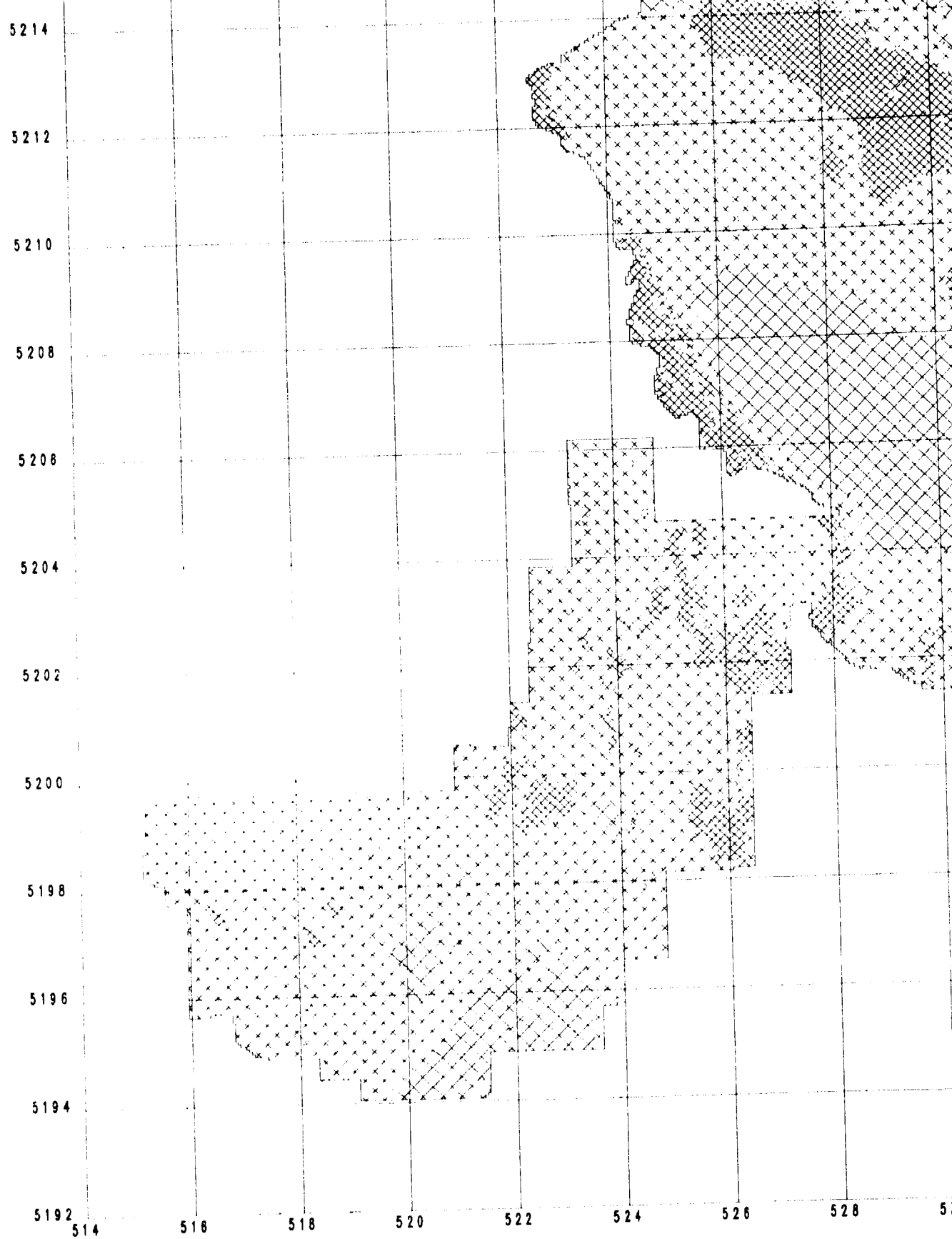


Plate 52. Soi

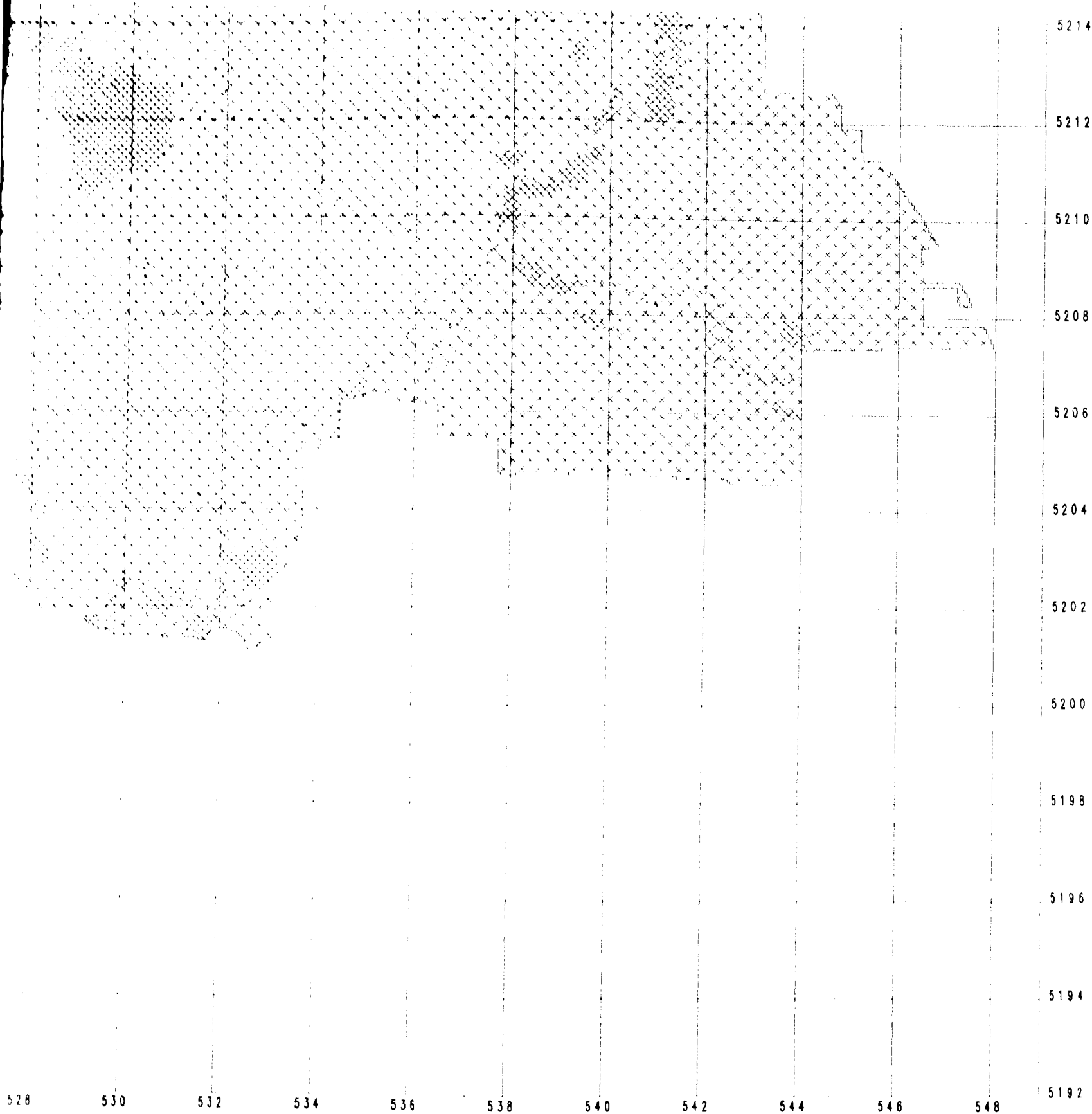
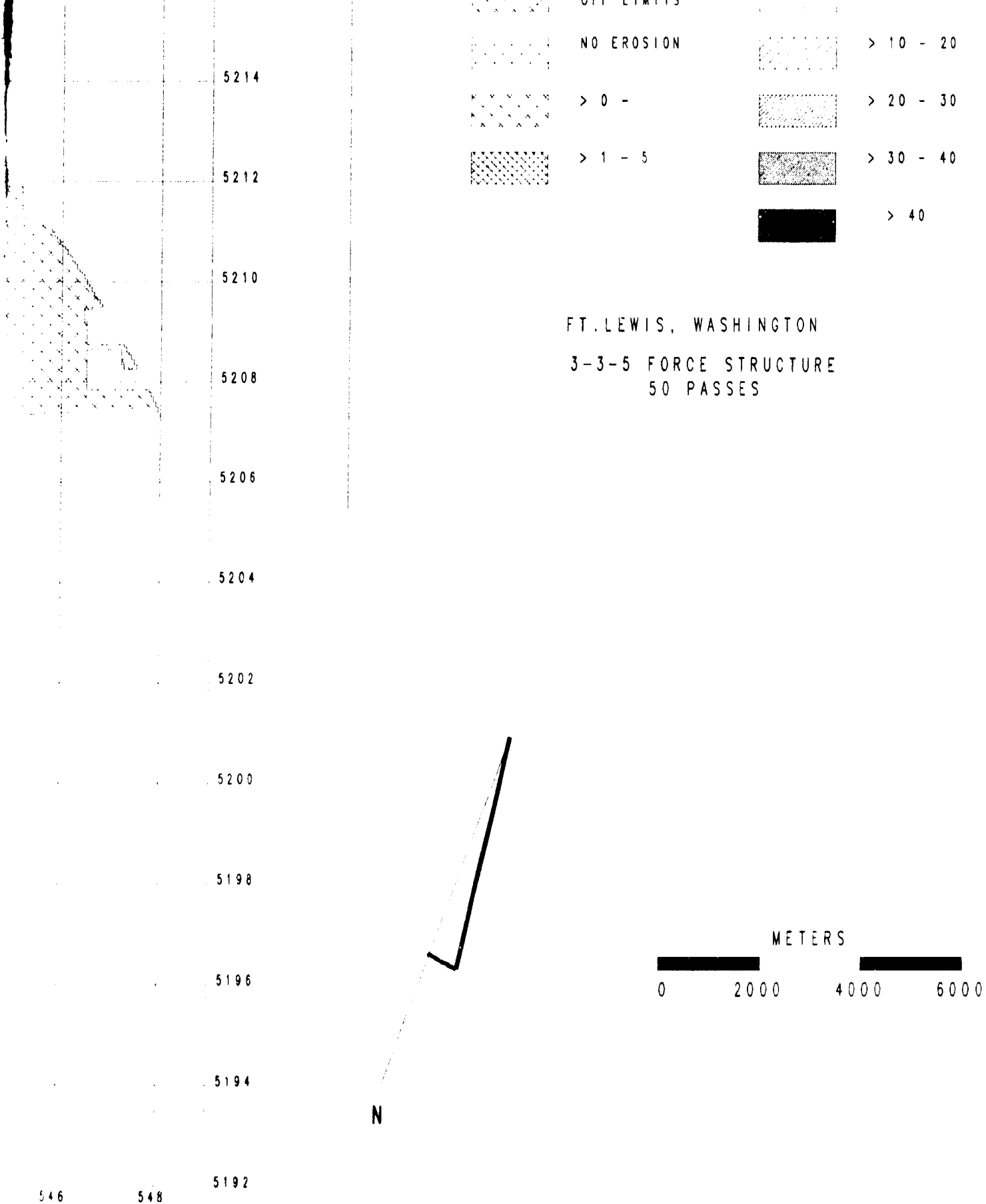
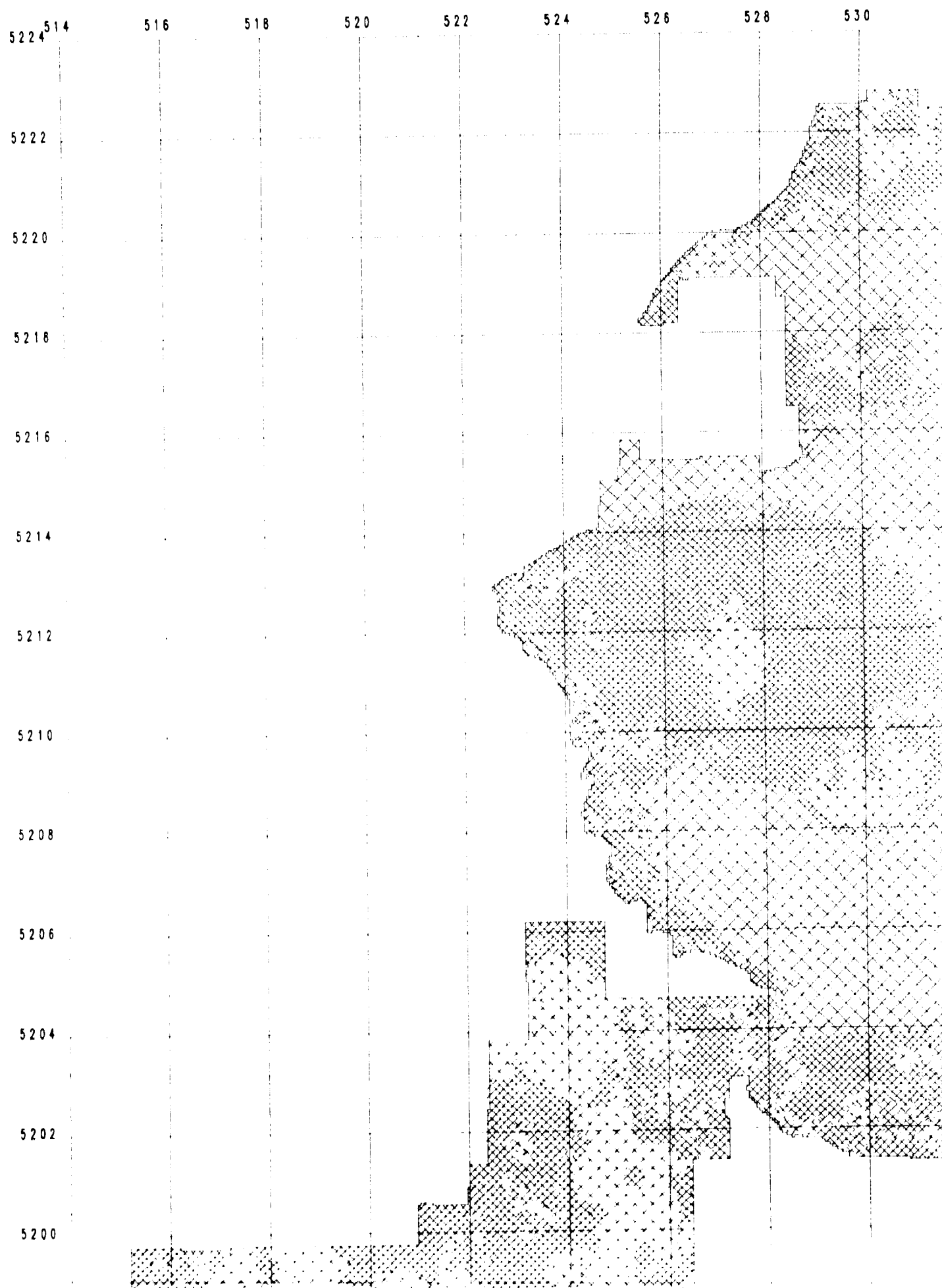


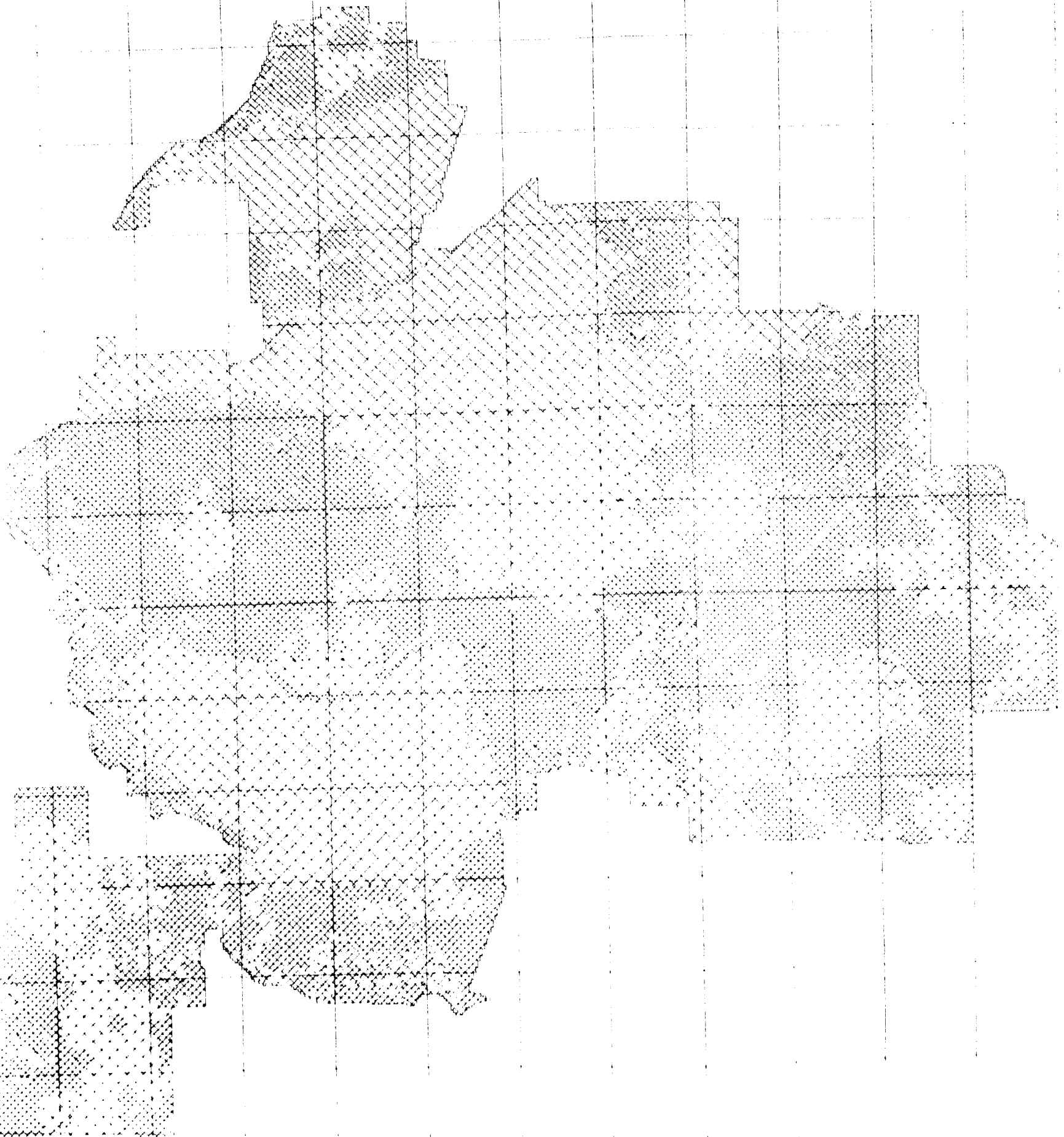
Figure 52. Soil erosion severity for 3-3-5 and 4-3-3 (HMMWV) force structures for fifty passes



res for fifty passes



524 526 528 530 532 534 536 538 540 542 544 546



46

548

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

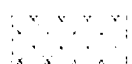
5202

5200

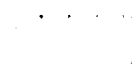


U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL EROSION SEVERITY
TOTAL POSSIBLE EROSION / SOIL GENERATION RATE
SCALE 1:100000



URBAN/
OFF LIMITS



> 5 - 10



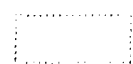
NO EROSION



> 10 - 20



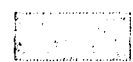
> 0 - 1



> 20 - 30



> 1 - 5



> 30 - 40



> 40

FT. LEWIS, WASHINGTON

3-3-5 FORCE STRUCTURE
1000 PASSES

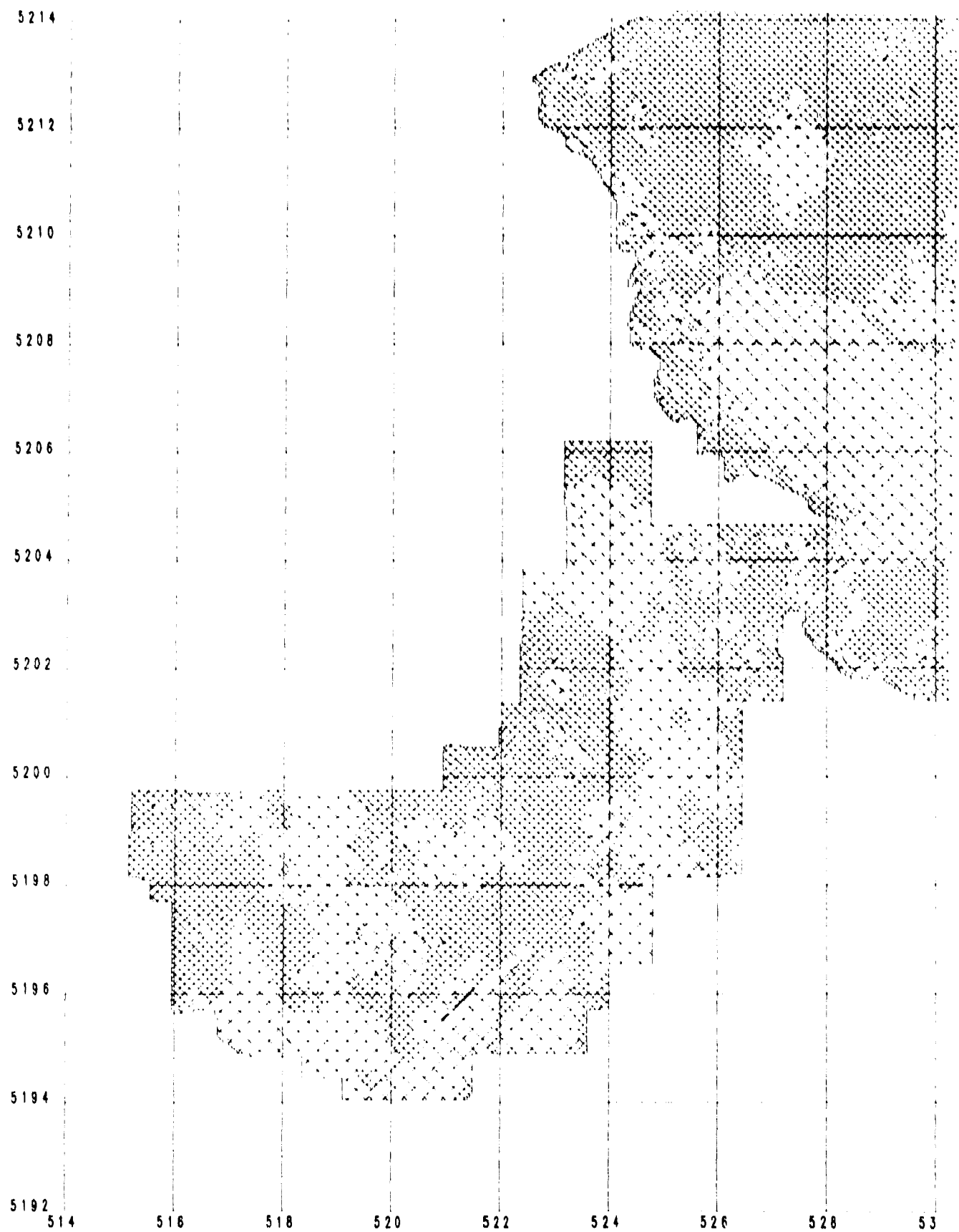


Plate 53. Soil e



Soil erosion severity for 3-3-5 and 4-3-3 (HMMWV) force structures for one thousand passes

5214

> 0 - 1

> 20 - 30

5212

> 1 - 5

> 30 - 40

5210

> 40

FT. LEWIS, WASHINGTON

3-3-5 FORCE STRUCTURE
1000 PASSES

5208

5206

5204

5202

5200

5198

5196

5194

5192

METERS

0 2000 4000 6000

N

546

548

res for one thousand passes

5224⁵¹⁴ 516 518 520 522 524 526 528 530 532

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200

5198



528 530 532 534 536 538 540 542 544 546 548

5224

5222

5220

5218

5216

5214

5212

5210

520

520

520

520

520

548

548

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL EROSION SEVERITY
TOTAL POSSIBLE EROSION / SOIL GENERATION RATE
SCALE 1:100000



URBAN/
OFF LIMITS



> 5 - 10



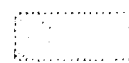
NO EROSION



> 10 - 20



> 0 - 1



> 20 - 30



> 1 - 5



> 30 - 40



> 40

FT. LEWIS, WASHINGTON

4-3-3 FORCE STRUCTURE
10 PASSES

5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

5194

5192

514

516

518

520

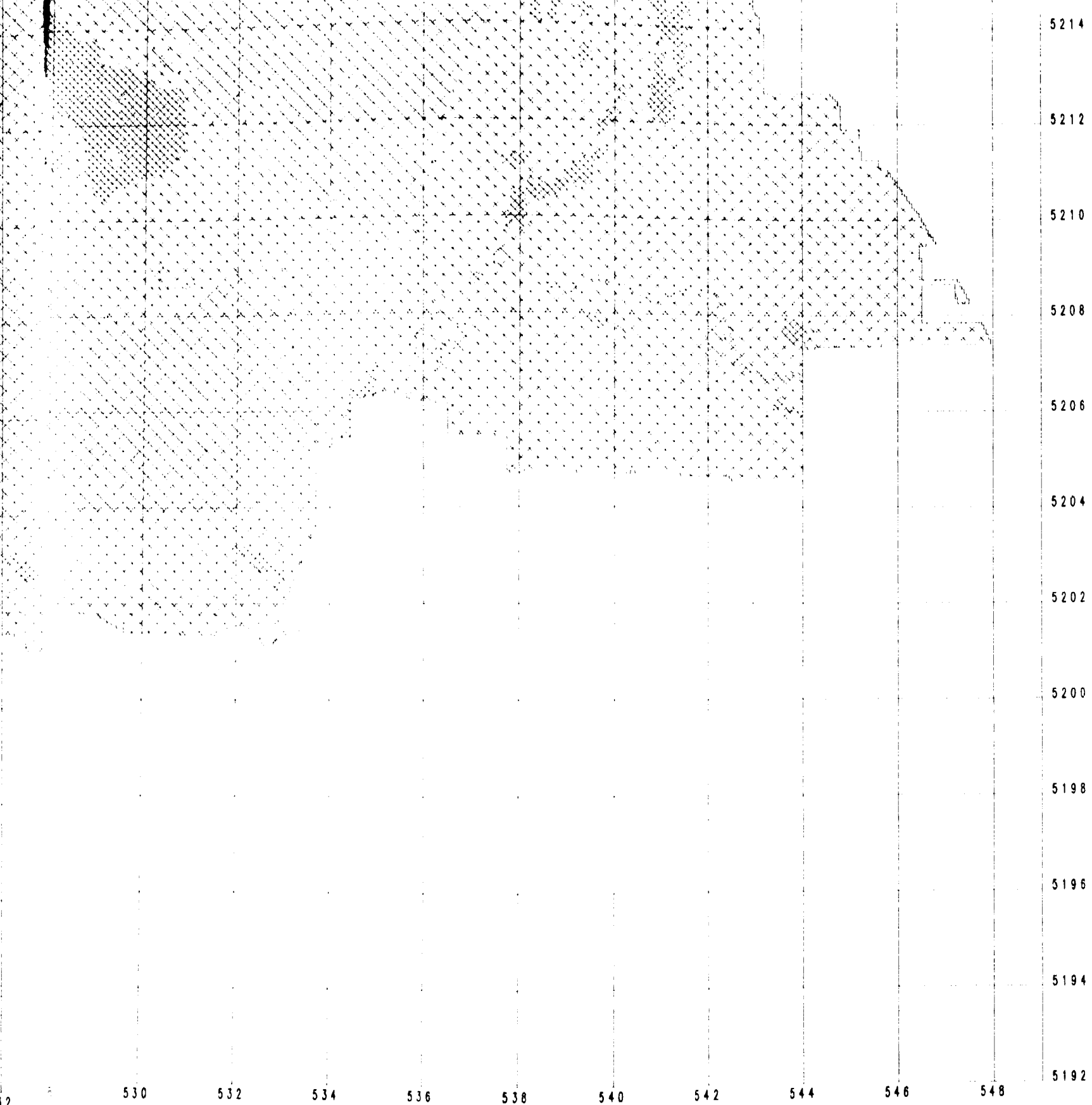
522

524

526

528

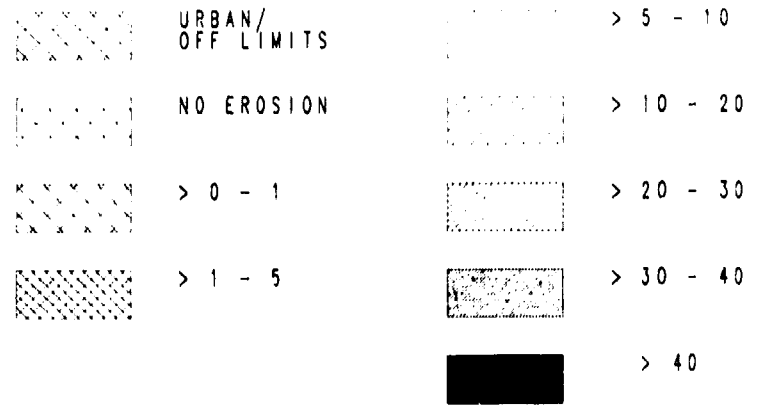
530



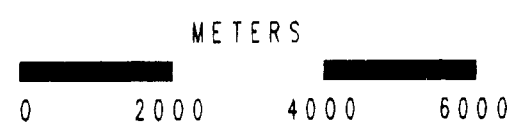
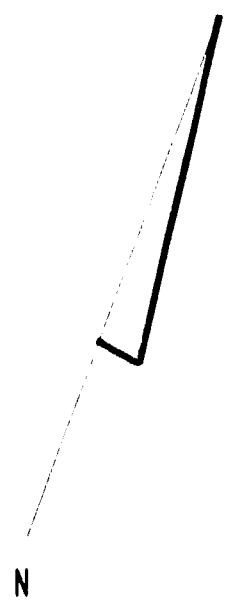
er. Plate 54. Soil erosion severity for 4-3-3 (8X8) force structure for ten passes

5216
5214
5212
5210
5208
5206
5204
5202
5200
5198
5196
5194
5192

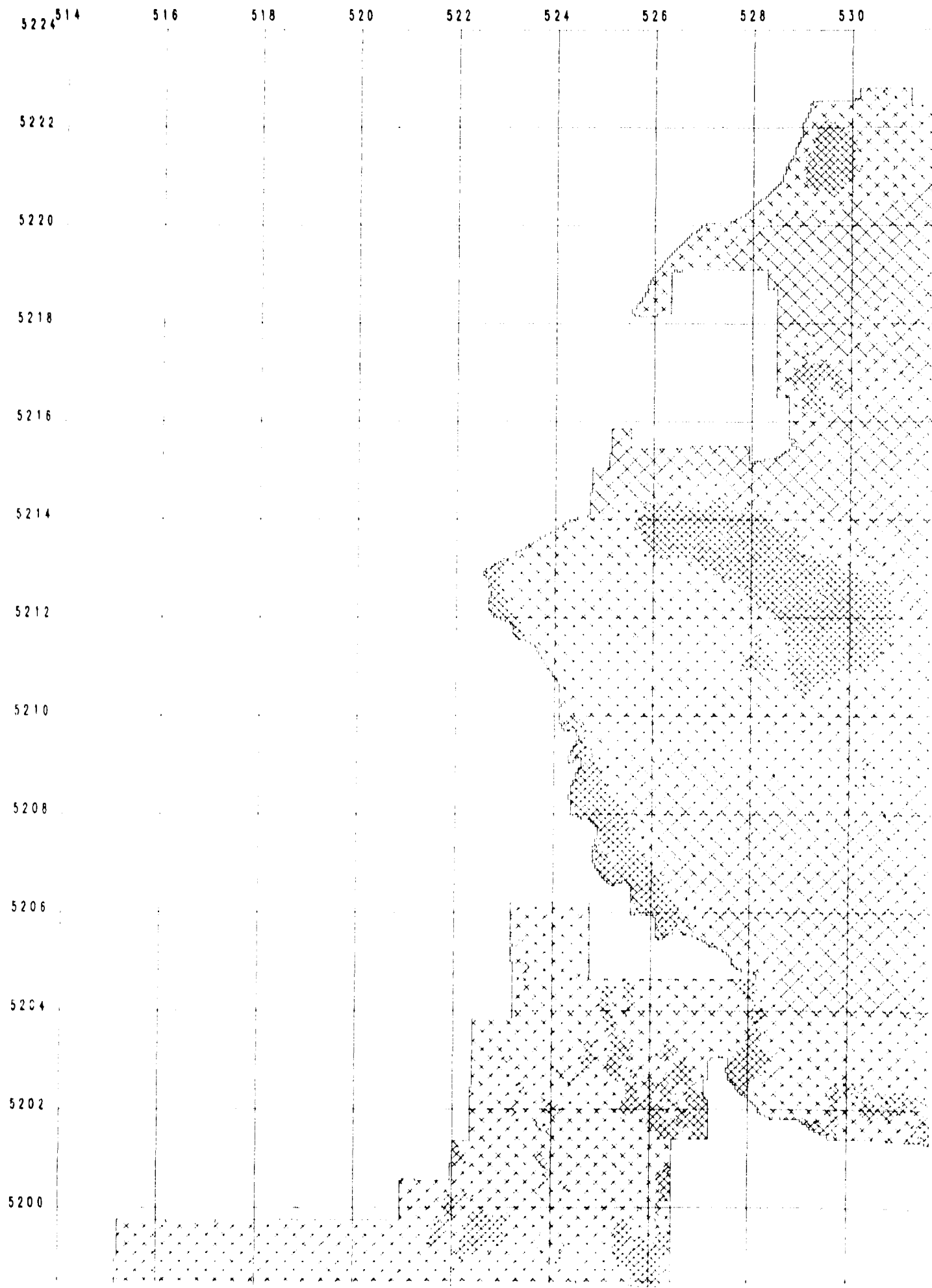
546 548



FT. LEWIS, WASHINGTON
4-3-3 FORCE STRUCTURE
10 PASSES



or ten passes



528 530 532 534 536 538 540 542 544 546 548 5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200

546

548

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

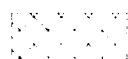
5202

5200



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL EROSION SEVERITY
TOTAL POSSIBLE EROSION / SOIL GENERATION RATE
SCALE 1:100000



URBAN/
OFF LIMITS

> 5 - 10



NO EROSION

> 10 - 20



> 0 - 1

> 20 - 30



> 1 - 5

> 30 - 40



> 40

FT. LEWIS, WASHINGTON

4-3-3 FORCE STRUCTURE
50 PASSES

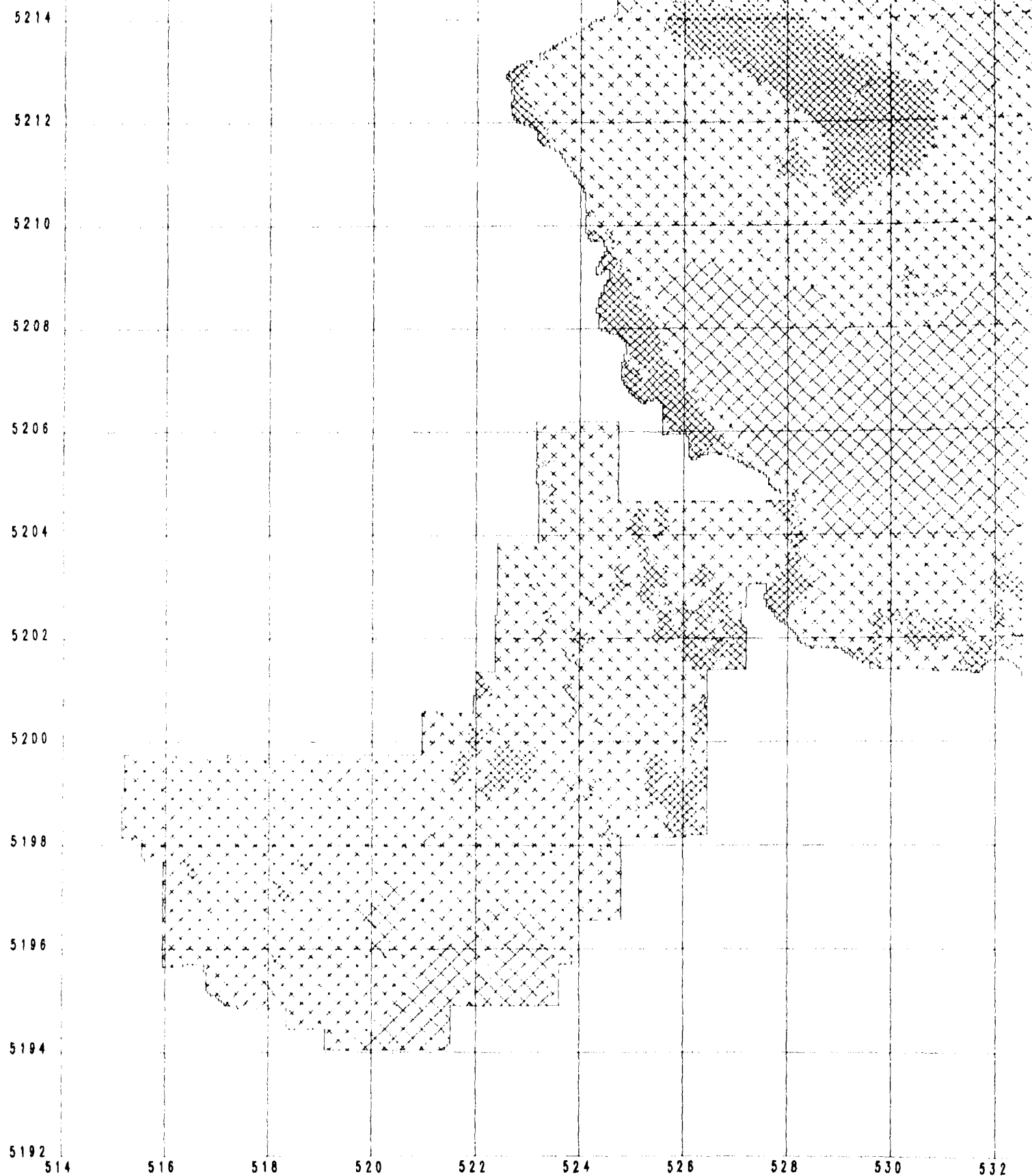


Plate 55. Soil

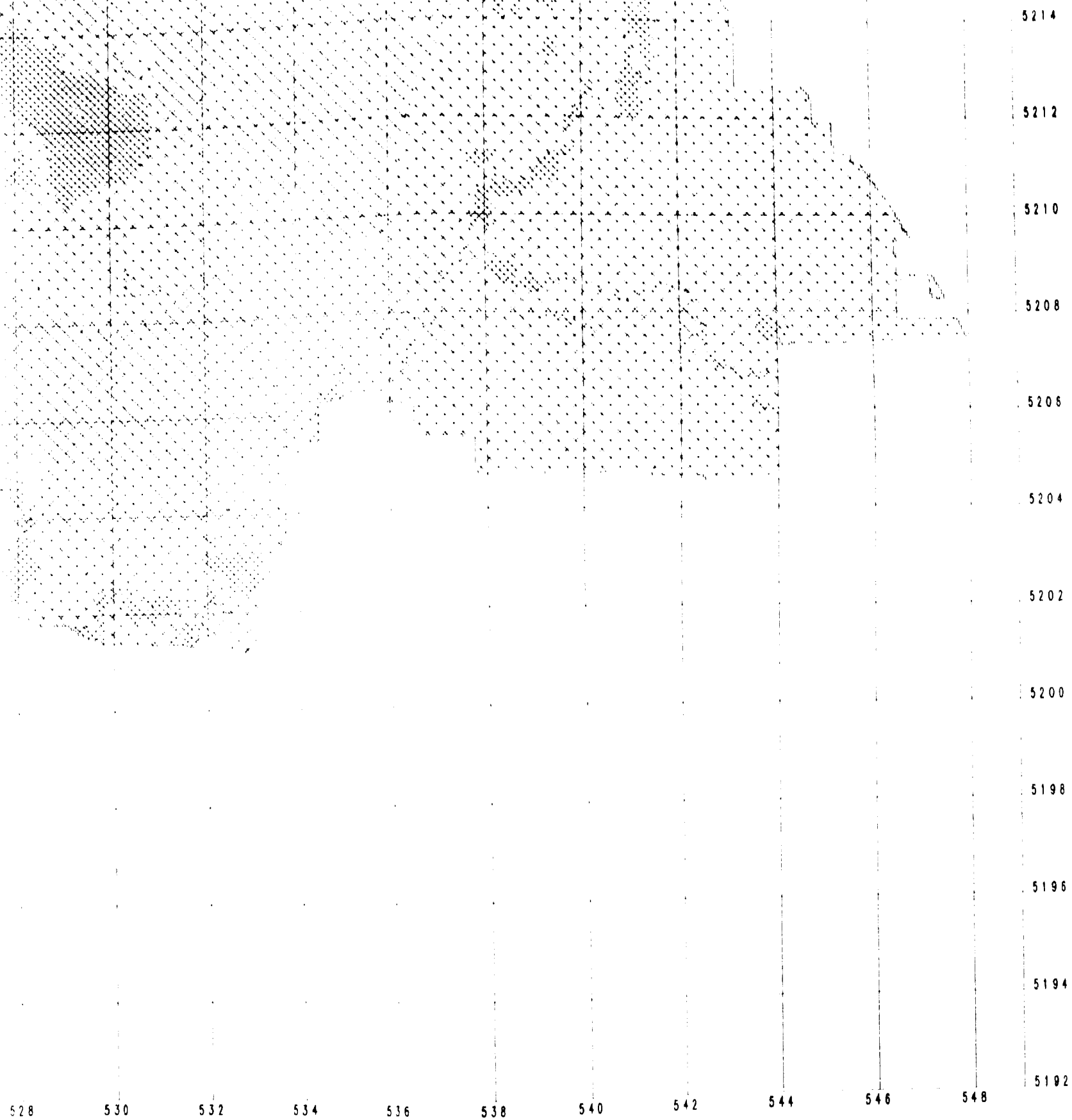
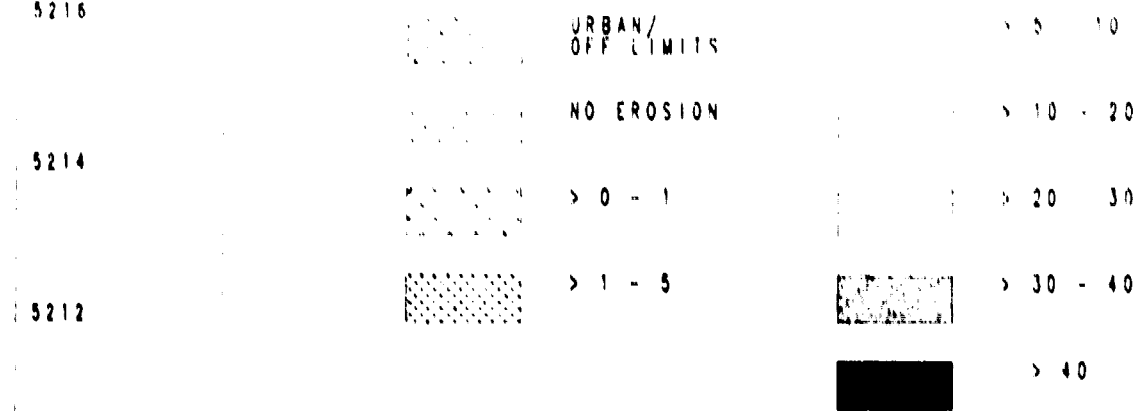
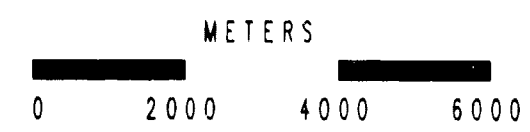
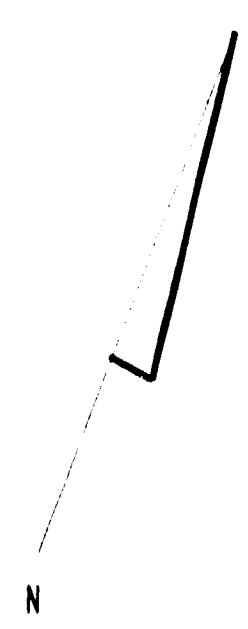


plate 55. Soil erosion severity for 4-3-3 (8X8) force structure for fifty passes



FT. LEWIS, WASHINGTON
 4-3-3 FORCE STRUCTURE
 50 PASSES

5216
 5214
 5212
 5210
 5208
 5206
 5204
 5202
 5200
 5198
 5196
 5194
 5192



546 548

r fifty passes

5224⁵¹⁴

518

518

520

522

524

526

528

530

532

5222

5220

5218

5216

5214

5212

5210

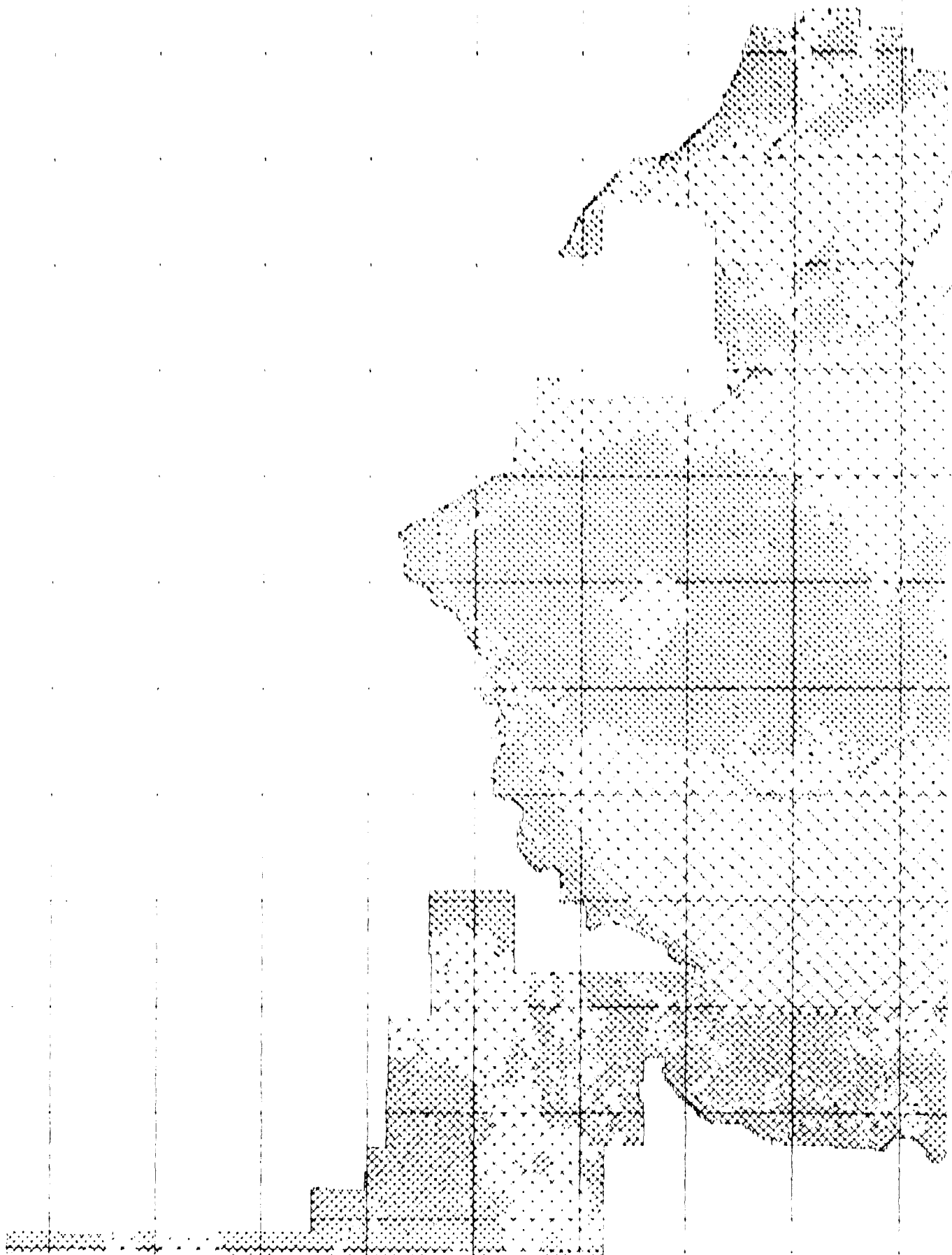
5208

5206

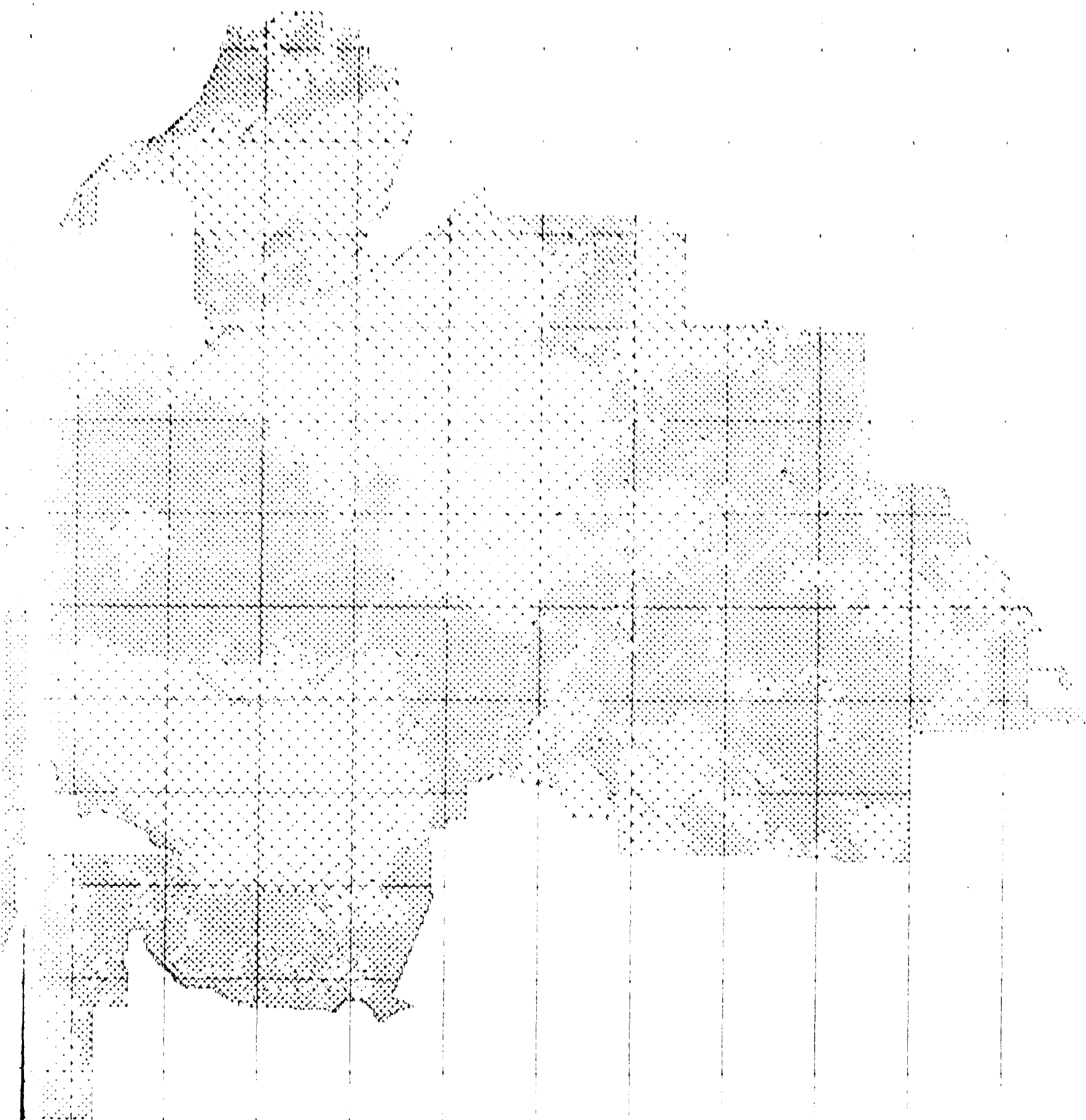
5204

5202

5200



528 528 530 532 534 536 538 540 542 544 546



540

540

5224

5222

5220



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL EROSION SEVERITY
TOTAL POSSIBLE EROSION / SOIL GENERATION RATE
SCALE 1:100000

5218

URBAN/
OFF LIMITS

> 5 - 10

5214

NO EROSION

> 10 - 20

5212

> 0 - 1

> 20 - 30

> 1 - 5

> 30 - 40

> 40

5210

FT. LEWIS, WASHINGTON

5208

4-3-3 FORCE STRUCTURE
1000 PASSES

5206

5204

5202

5200

5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

5194

5192

514

516

518

520

522

524

526

528

530

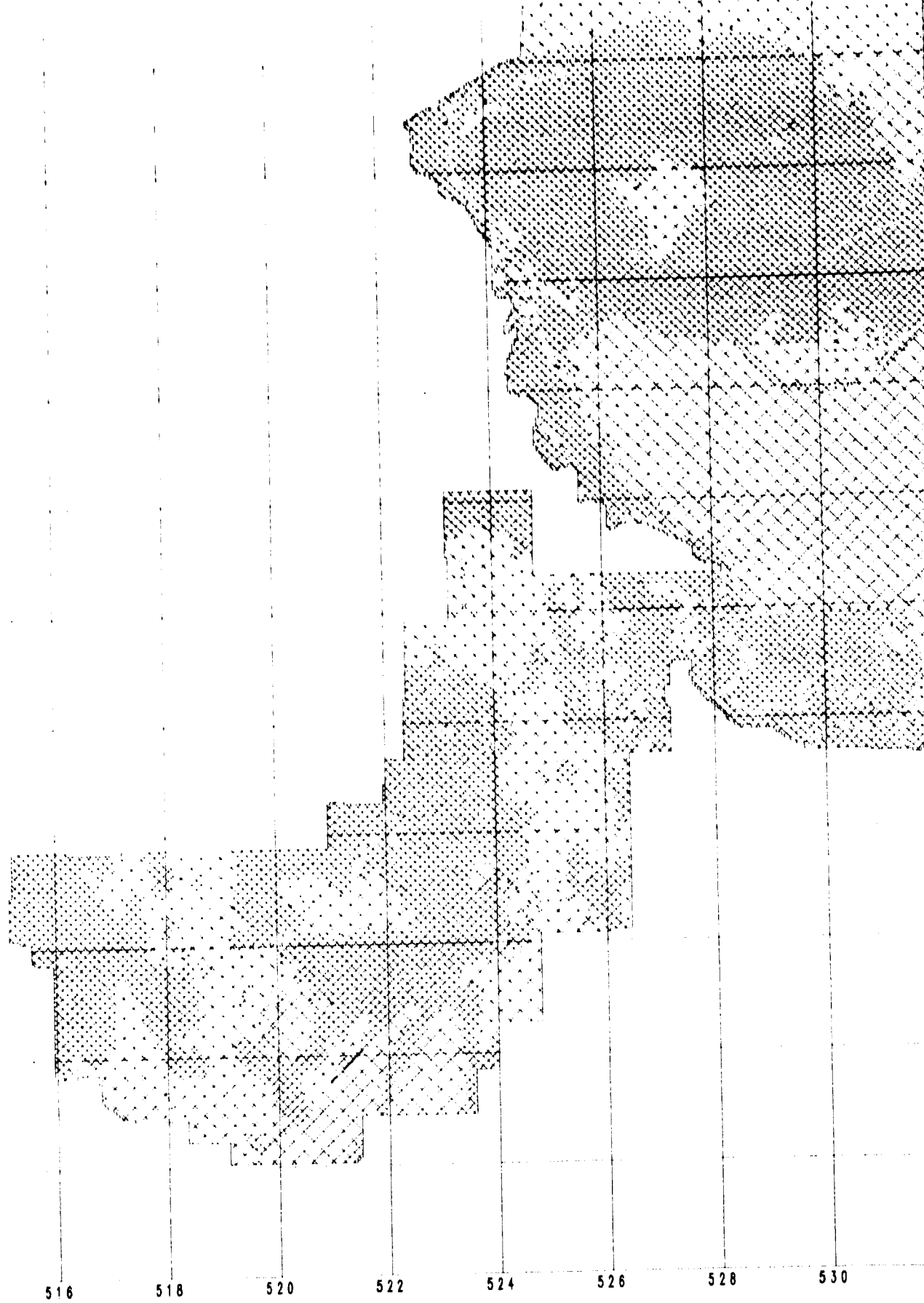
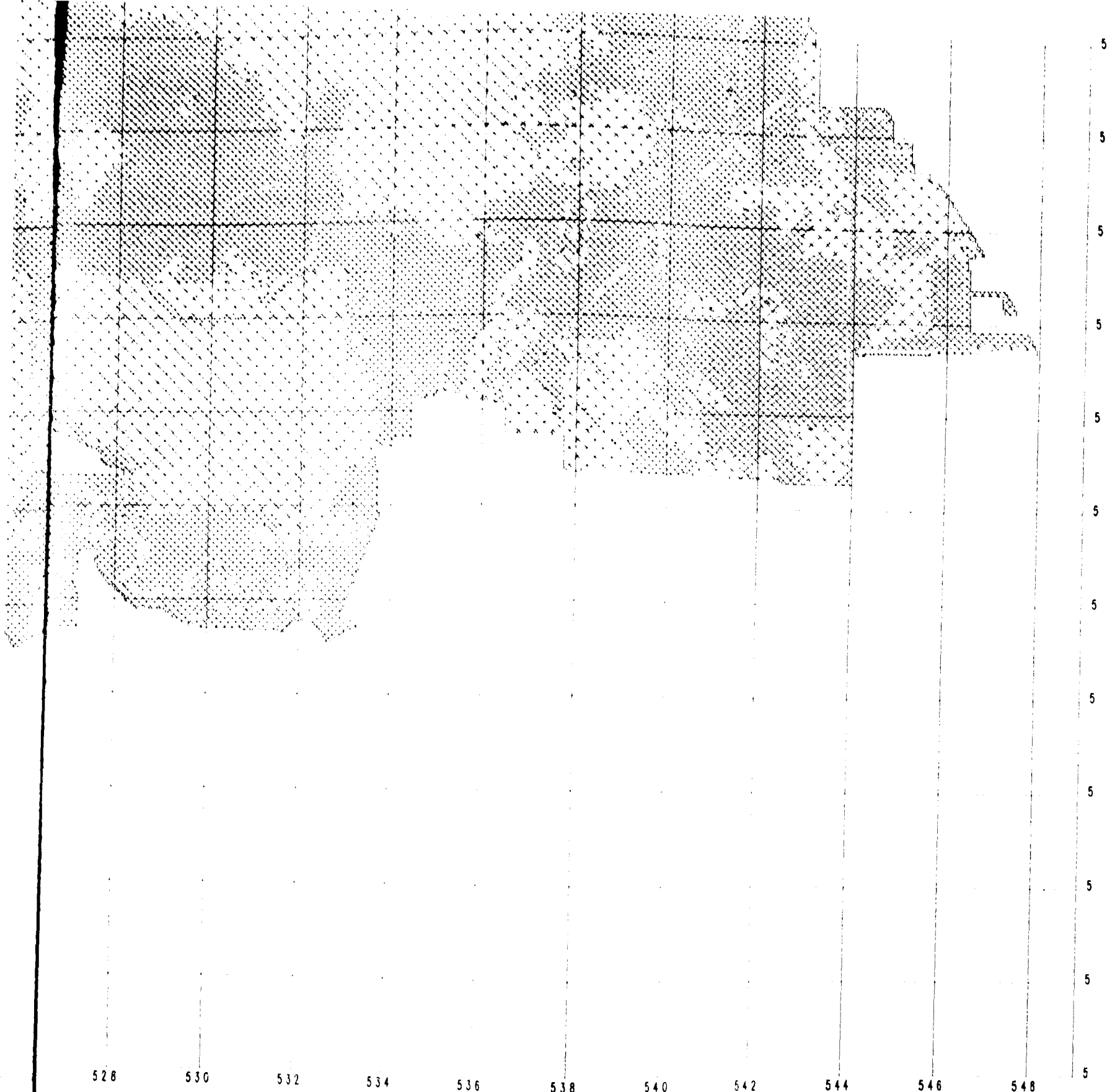
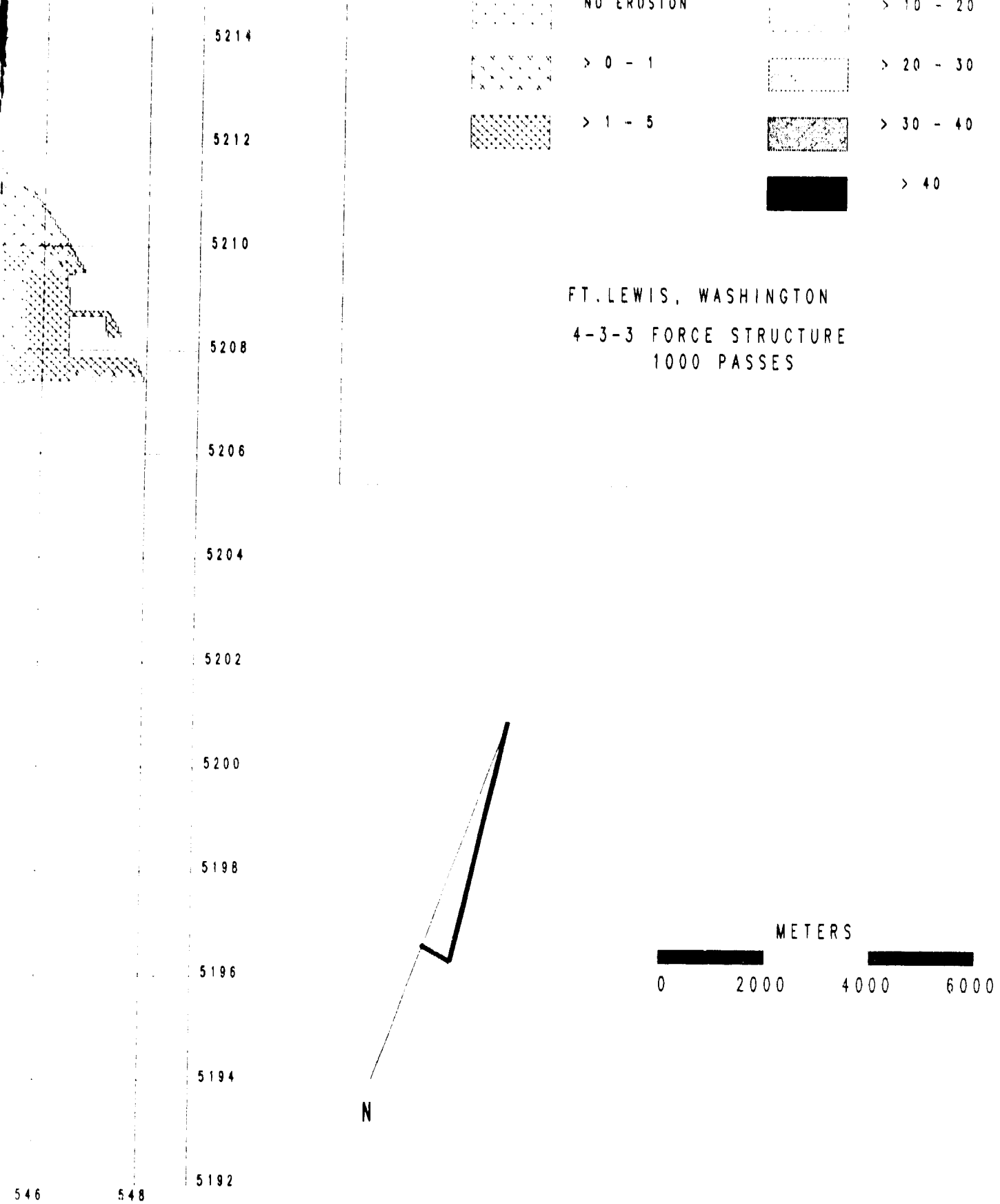


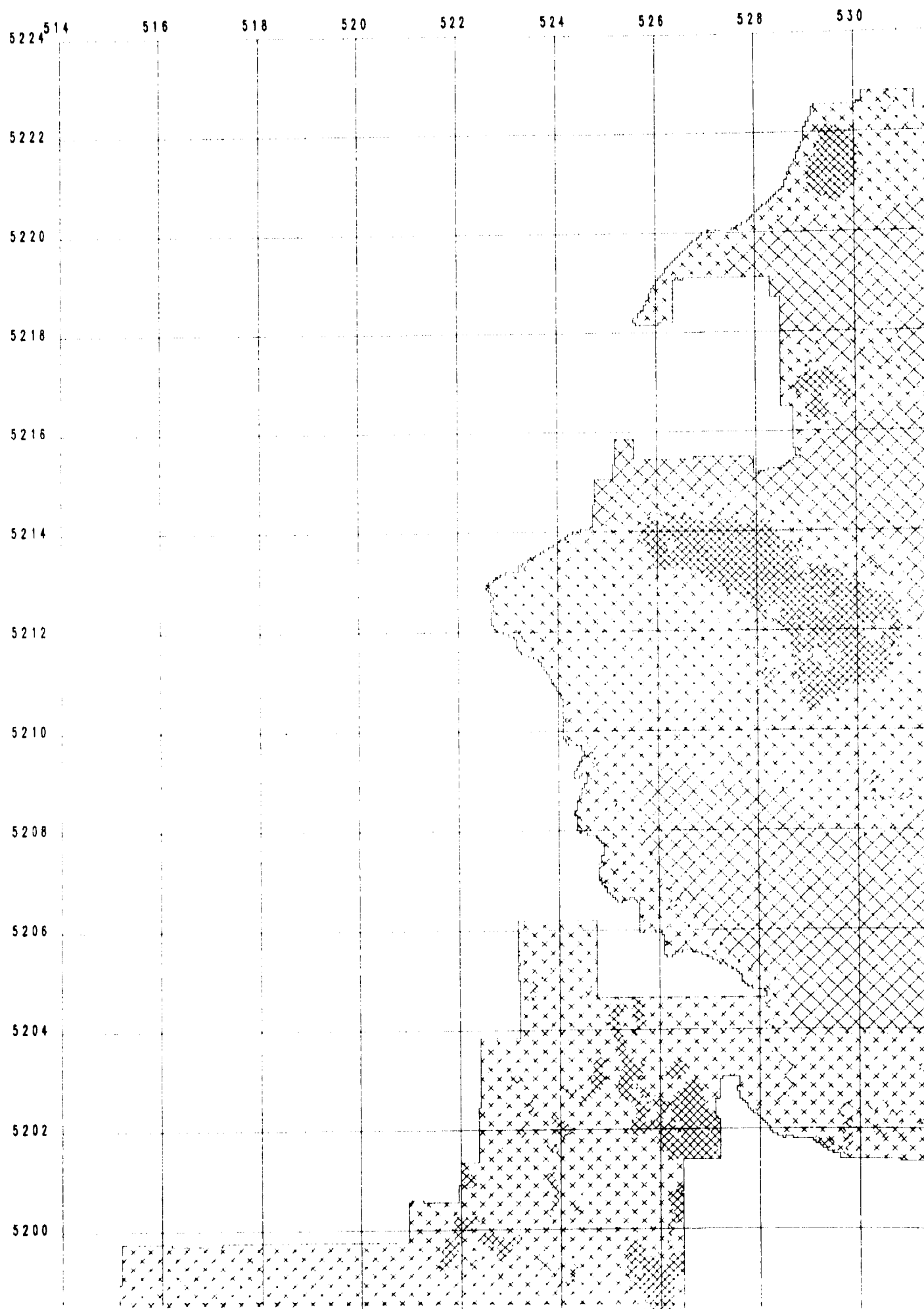
Plate 56. Soil e

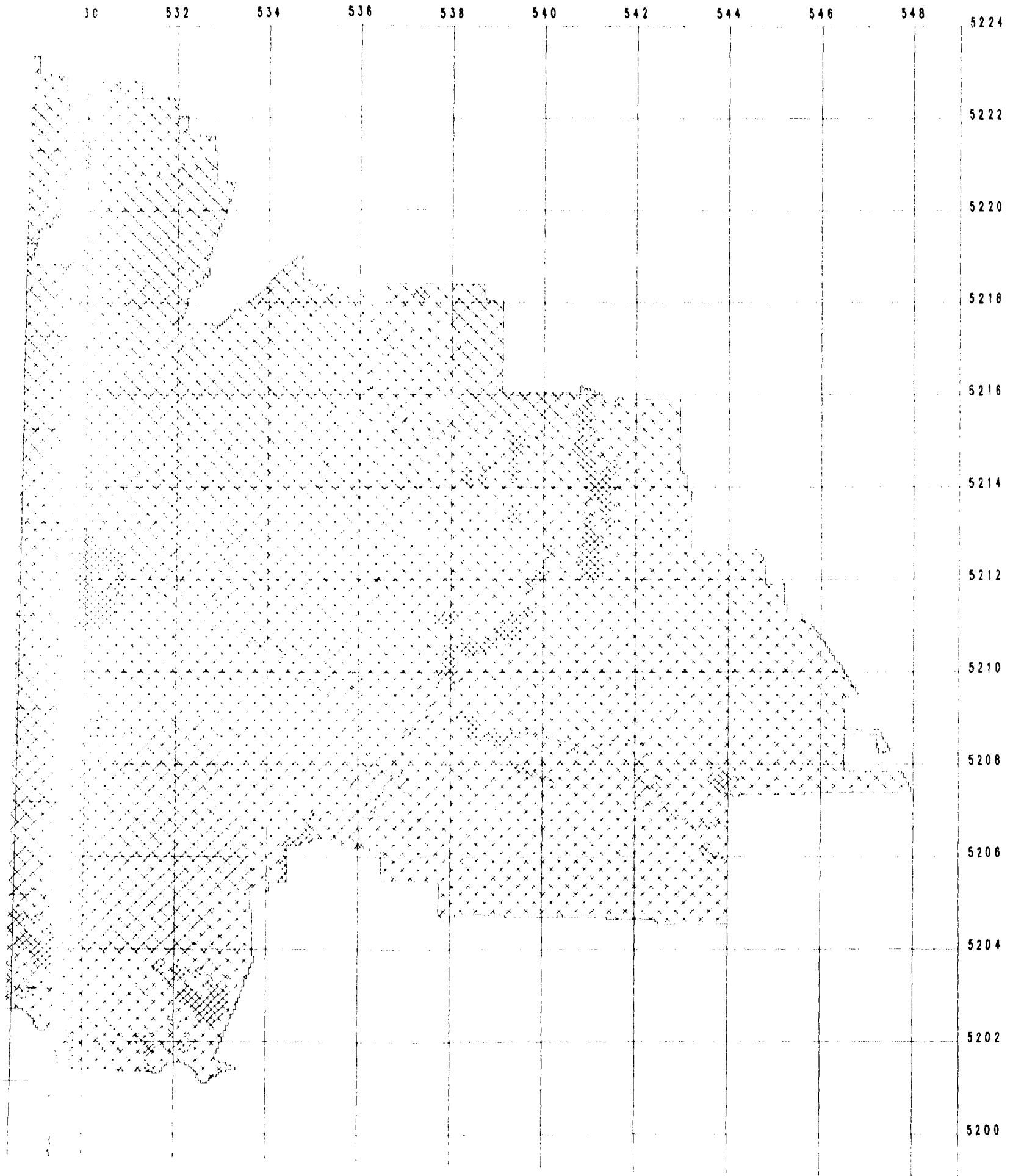


sio Plate 56. Soil erosion severity for 4-3-3 (8X8) force structure for one thousand pass



e thousand passes







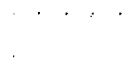
U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL EROSION SEVERITY
TOTAL POSSIBLE EROSION / SOIL GENERATION RATE
SCALE 1:100000

5216



URBAN/
OFF LIMITS

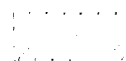


> 5 - 10

5214



NO EROSION



> 10 - 20



> 0 - 1



> 20 - 30

5212



> 1 - 5



> 30 - 40



> 40

5210

FT. LEWIS, WASHINGTON

5208

5-5-0 FORCE STRUCTURE
10 PASSES

5206

5204

5202

5200

5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

5194

5192
514

516

518

520

522

524

526

528

530

Plate

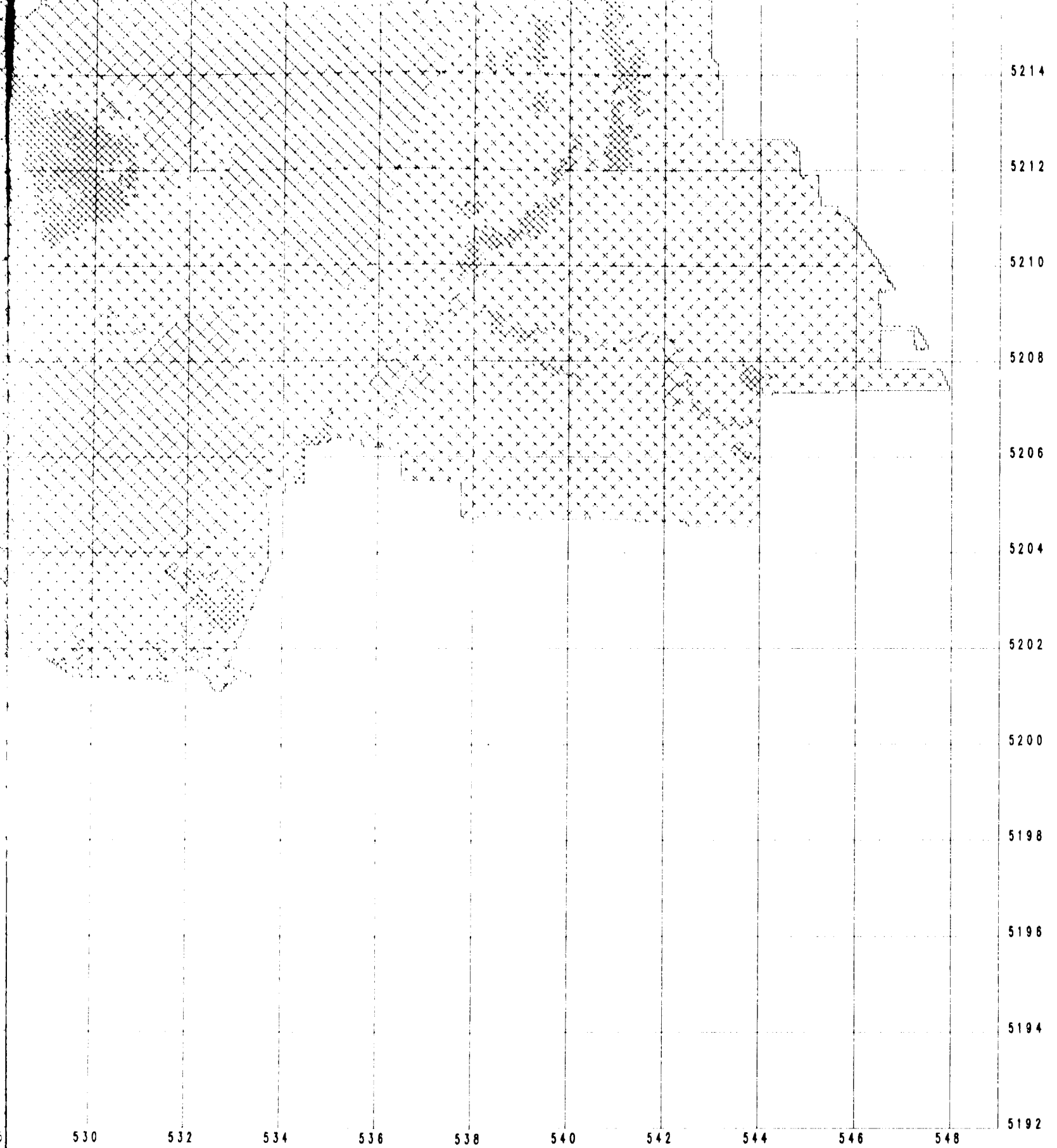


Plate 57. Soil erosion severity for 5-5-0 force structure for ten passes

5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

5194

5192

NO EROSION

> 0 - 1

> 1 - 5

> 10 - 20

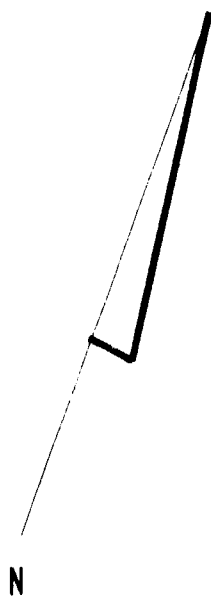
> 20 - 30

> 30 - 40

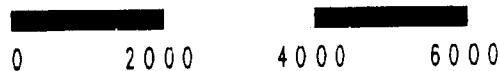
> 40

FT. LEWIS, WASHINGTON

5-5-0 FORCE STRUCTURE
10 PASSES



METERS



ten passes

5224⁵¹⁴

516

518

520

522

524

526

528

530

532

5222

5220

5218

5216

5214

5212

5210

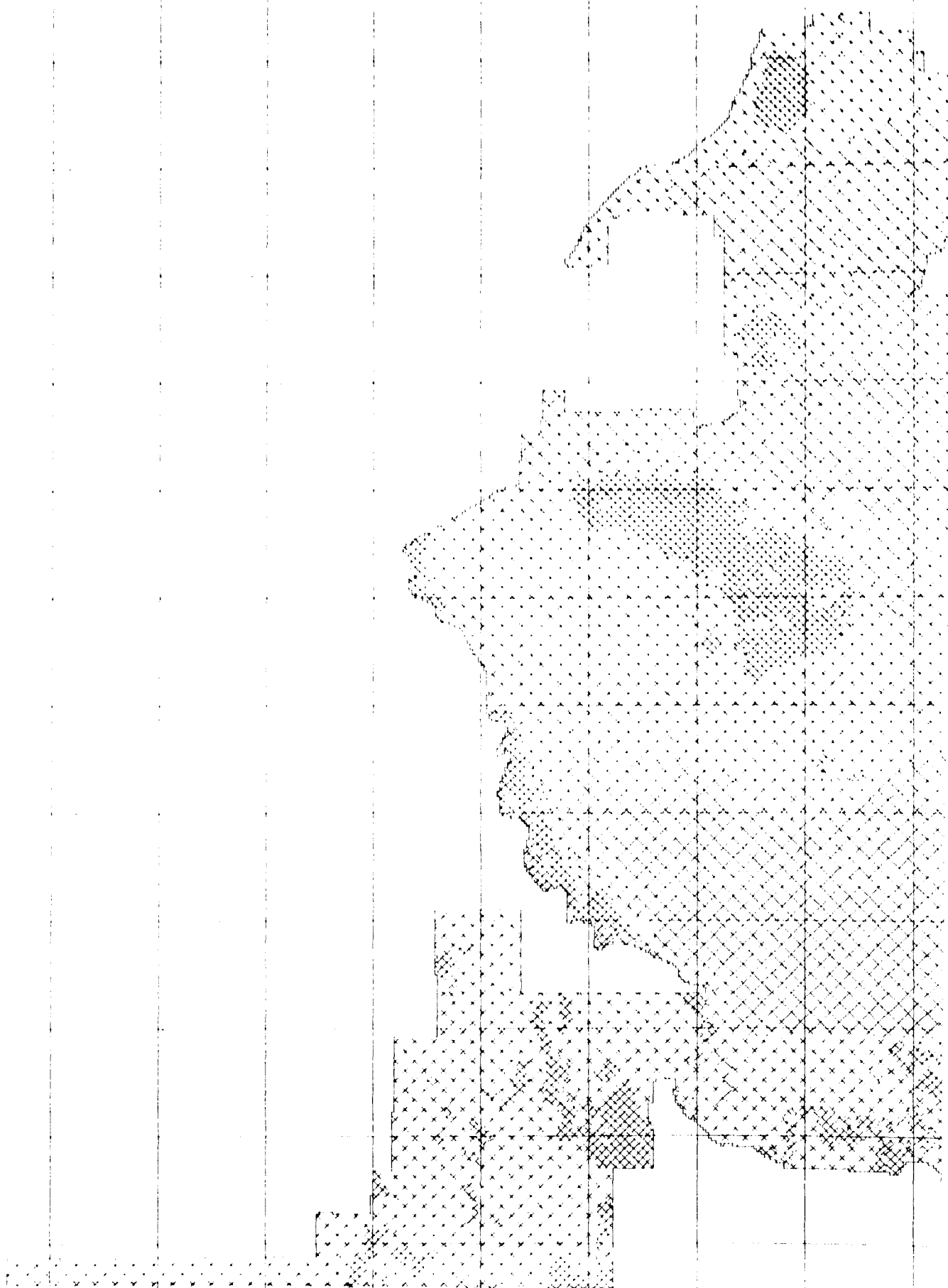
5208

5206

5204

5202

5200



520 530 532 534 536 538 540 542 544 546 548



540

540

5224

5222

5220



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL EROSION SEVERITY
TOTAL POSSIBLE EROSION / SOIL GENERATION RATE
SCALE 1:100000

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200

URBAN/
OFF LIMITS

> 5 - 10

NO EROSION

> 10 - 20

> 0 - 1

> 20 - 30

> 1 - 5

> 30 - 40

> 40

FT. LEWIS, WASHINGTON

5-5-0 FORCE STRUCTURE
50 PASSES

5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

5194

5192

514

516

518

520

522

524

526

528

530

Plate 58.

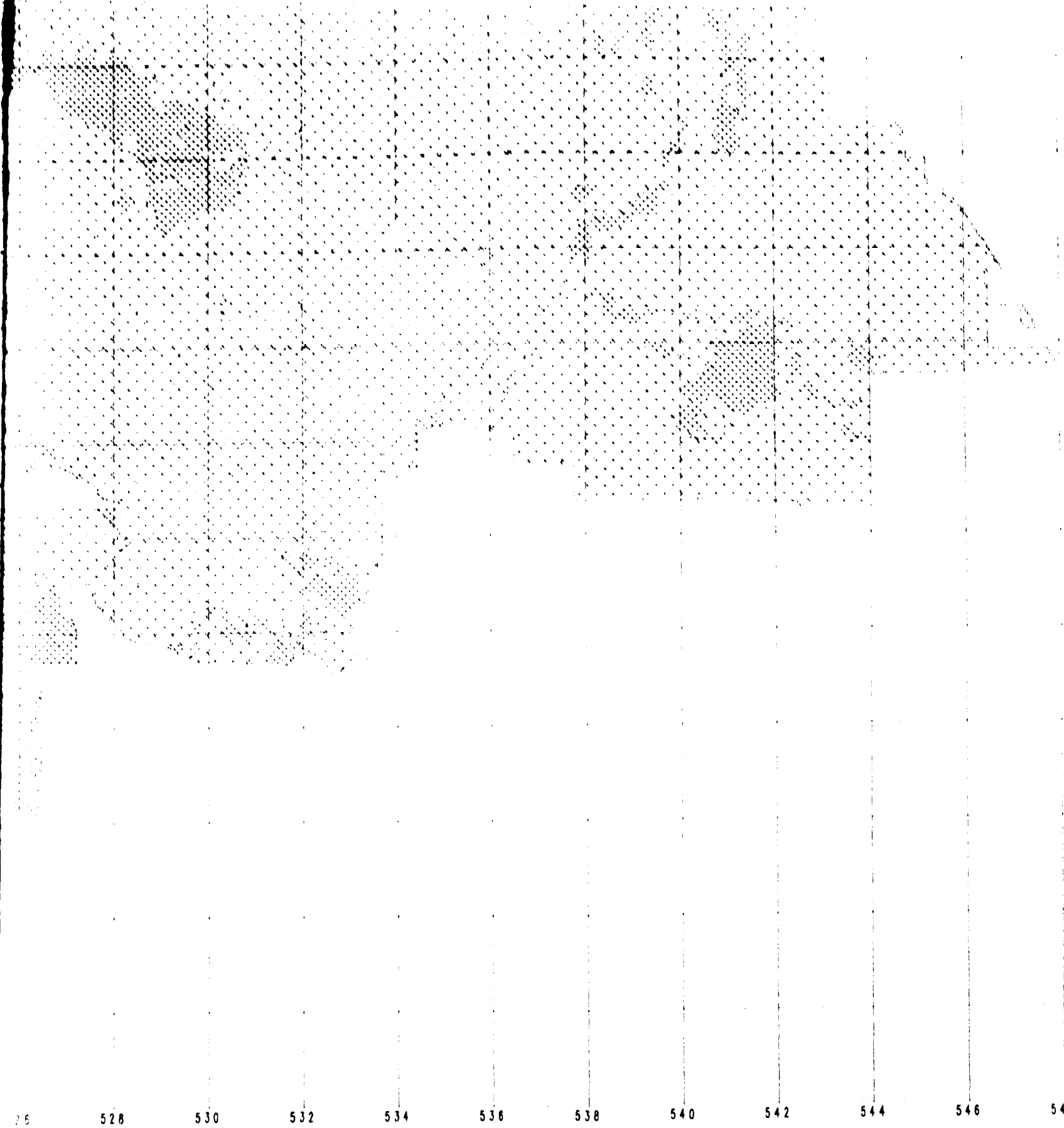


Plate 58. Soil erosion severity for 5-5-0 force structure for fifty passes

NO EROSION

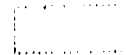
5214
5212
5210
5208
5206
5204
5202
5200
5198
5196
5194
5192
548



> 0 - 1



> 1 - 5



> 20 - 30



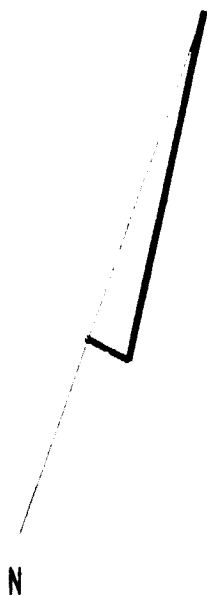
> 30 - 40



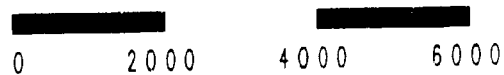
> 40

FT. LEWIS, WASHINGTON

5-5-0 FORCE STRUCTURE
50 PASSES



METERS



ty passes

5224⁵¹⁴

516

518

520

522

524

526

528

530

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200



526

528

530

532

534

536

538

540

542

544

546



548

546

548

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

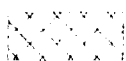
5202

5200



U. S. Army Corps of Engineers
Waterways
Experiment
Station

SOIL EROSION SEVERITY
TOTAL POSSIBLE EROSION / SOIL GENERATION RATE
SCALE 1:100000



URBAN/
OFF LIMITS



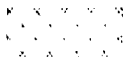
> 5 - 10



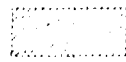
NO EROSION



> 10 - 20



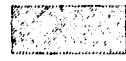
> 0 - 1



> 20 - 30



> 1 - 5



> 30 - 40



> 40

FT. LEWIS, WASHINGTON

5-5-0 FORCE STRUCTURE
1000 PASSES

5214
5212
5210
5208
5206
5204
5202
5200
5198
5196
5194
5192

514

516

518

520

522

524

526

528

Plate 5

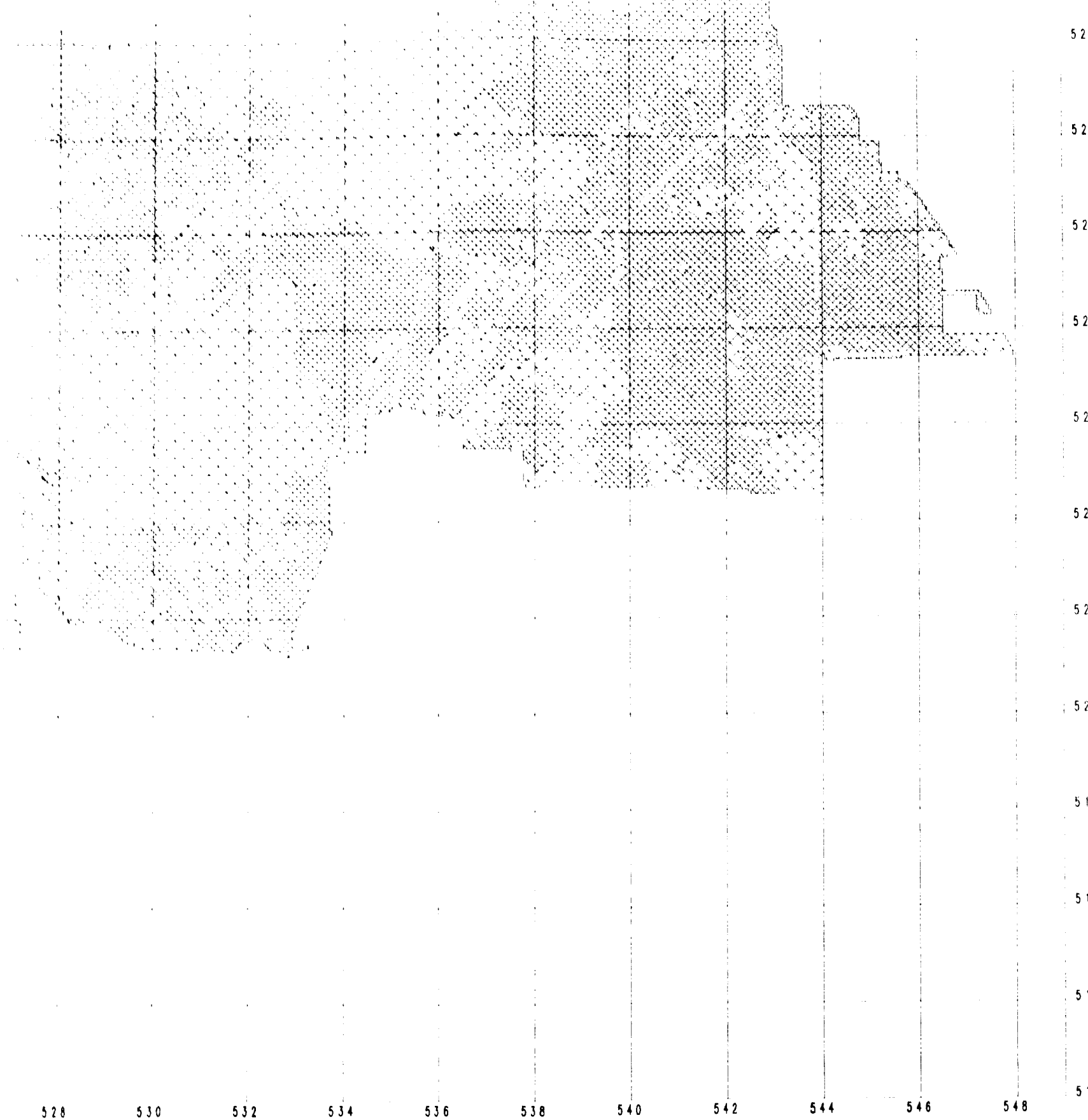


Plate 59. Soil erosion severity for 5-5-0 force structure for one thousand passes

5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

5194

5192

548

NO EROSION

> 0 - 1

> 1 - 5

> 10 - 20

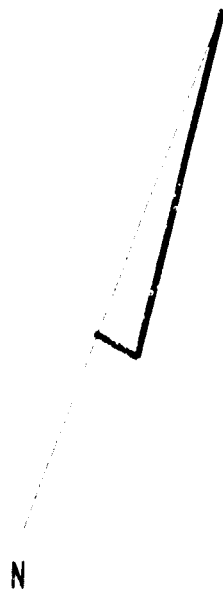
> 20 - 30

> 30 - 40

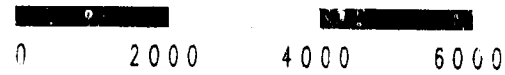
> 40

FT. LEWIS, WASHINGTON

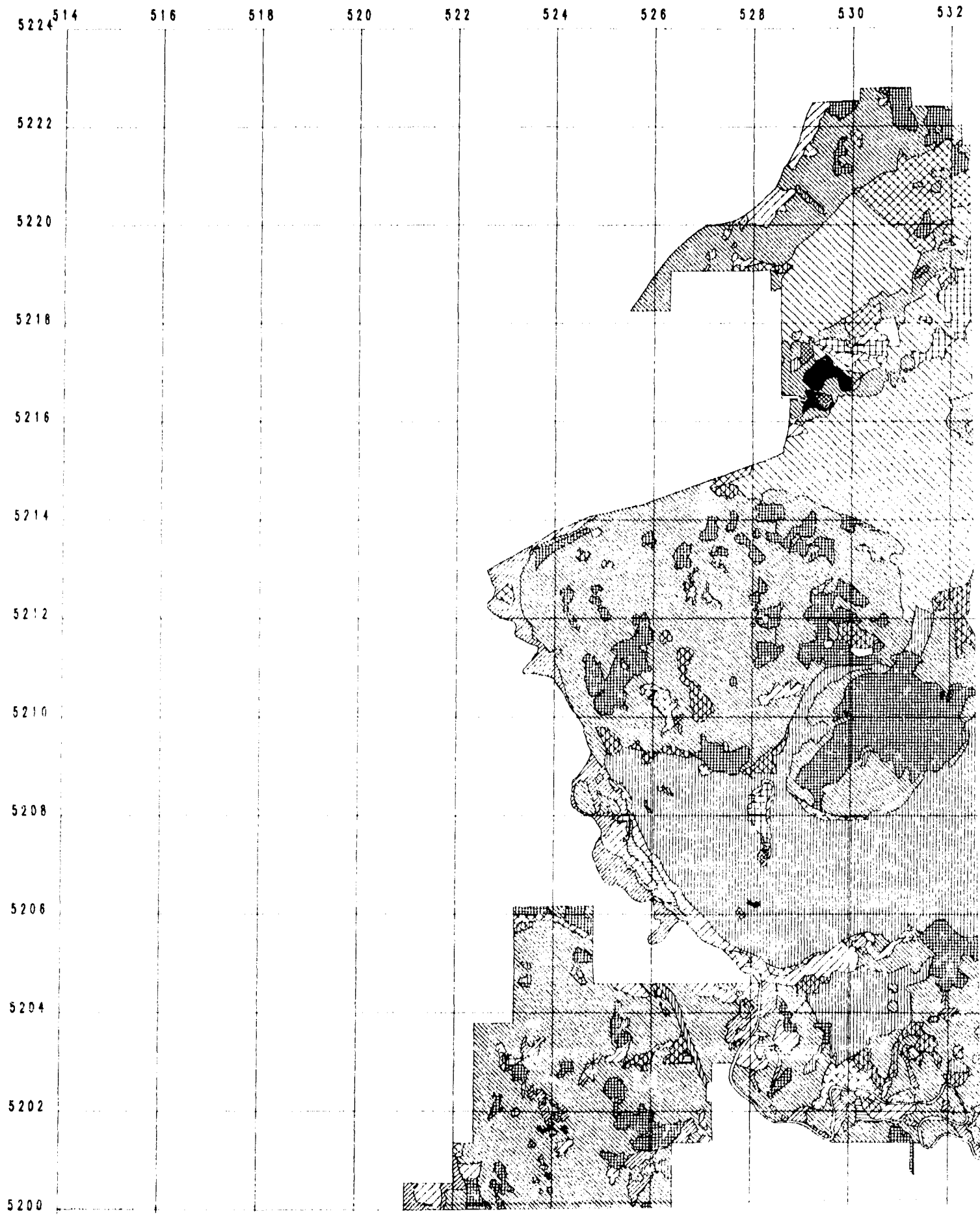
5-5-0 FORCE STRUCTURE
1000 PASSES



METERS

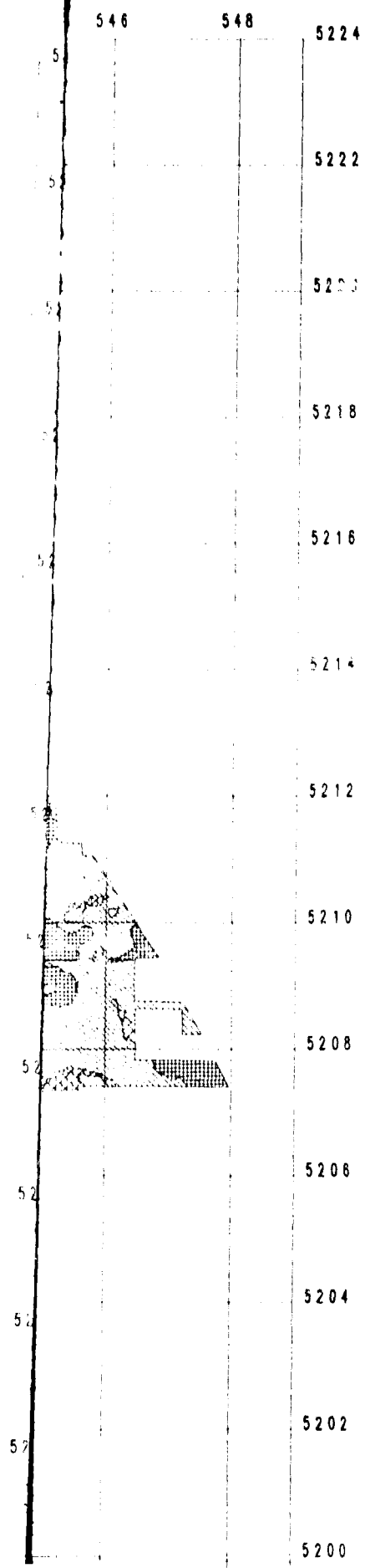


and passes



526 528 530 532 534 536 538 540 542 544 546 548





U. S. Army Corps of Engineers Waterways Experiment Station

MAJOR VEGETATION CATEGORIES

SCALE 1:100000

	B - BARE GROUND		G - GRASSLAND
	Em - EMERGENT MARSH		Gc - CLEARED GRASSLAND
	Fc - CONIFEROUS FOREST		Gm - MIXED GRASSLAND
	Fd - DECIDUOUS FOREST		OW - OPEN WATER
	Fm - MIXED CONIFEROUS/ DECIDUOUS FOREST		S - SHRUBLAND
	Fs - FORESTED SWAMP		SS - SCRUB/SHRUB SWAMP
	Fy - YOUNG FOREST		U - URBAN

FT LEWIS, WASHINGTON

5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

5194

5192
514

516

518

520

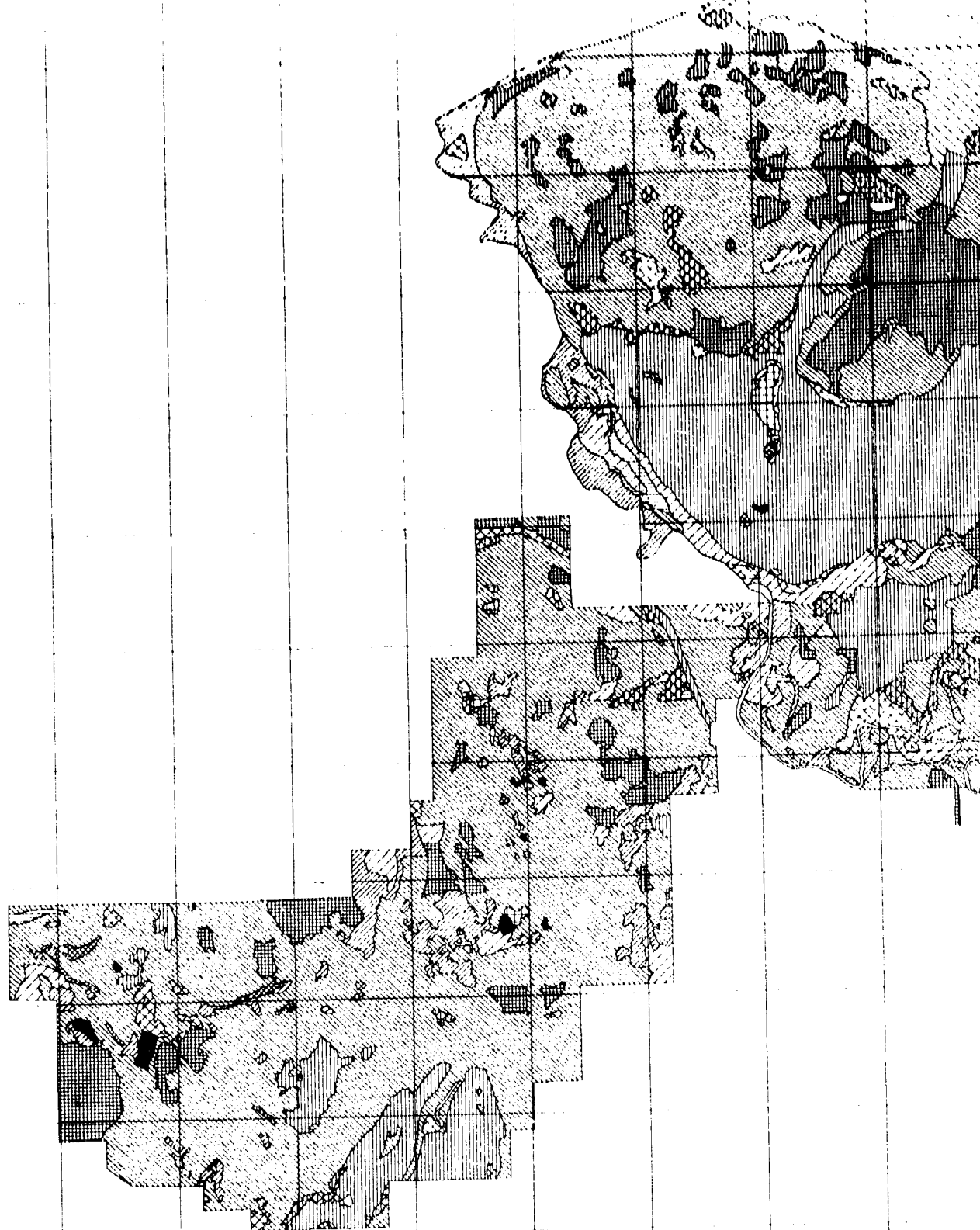
522

524

526

528

530



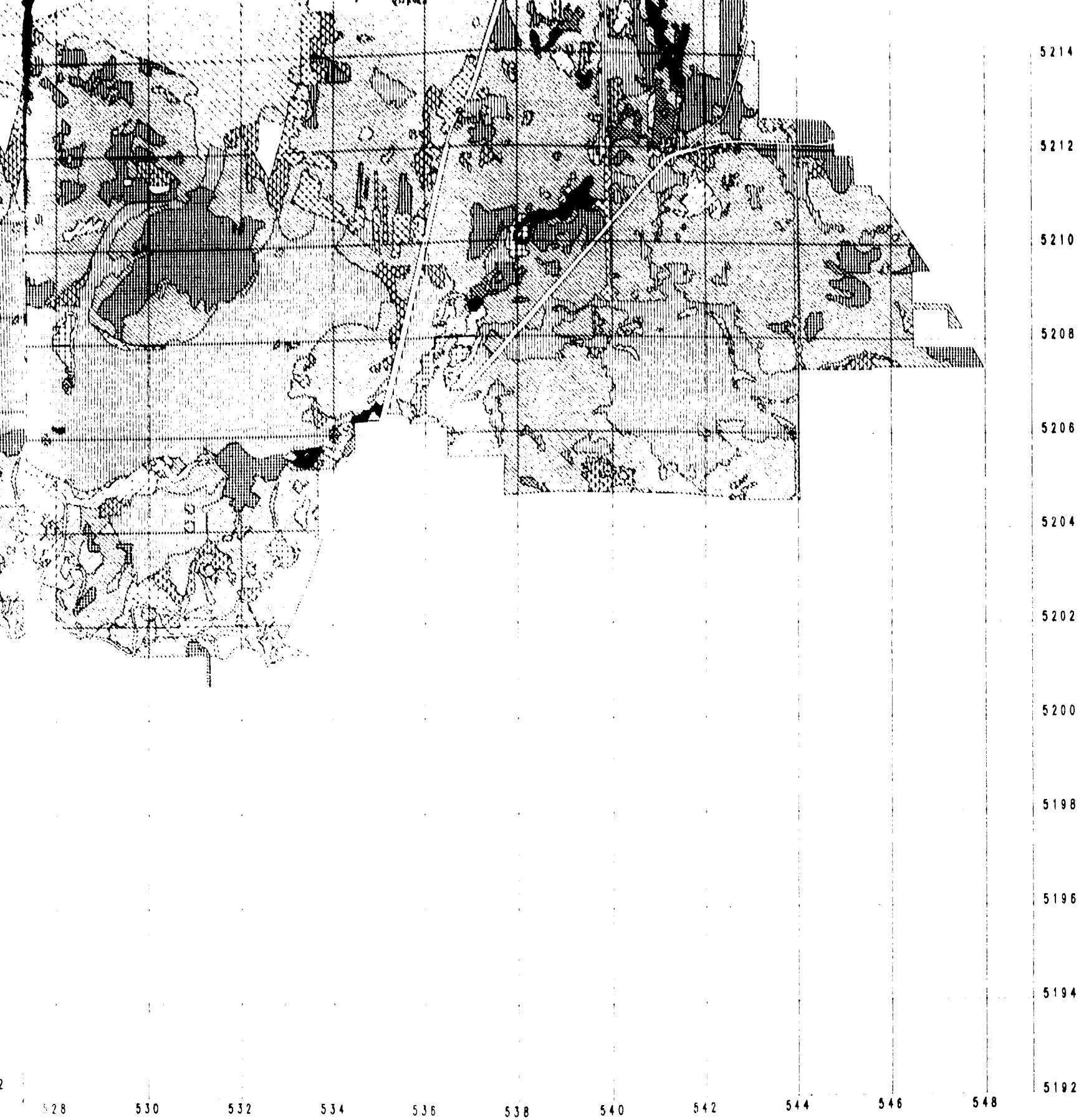


Plate 60. Major vegetation associations

5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

5194

5192

Fd - DECIDUOUS FOREST

Fm - MIXED CONIFEROUS/
DECIDUOUS FOREST

Fo - FORESTED SWAMP

Fy - YOUNG FOREST

Qw - OPEN WATER

S - SHRUBLAND

SS - SCRUB/SHRUB SWAMP

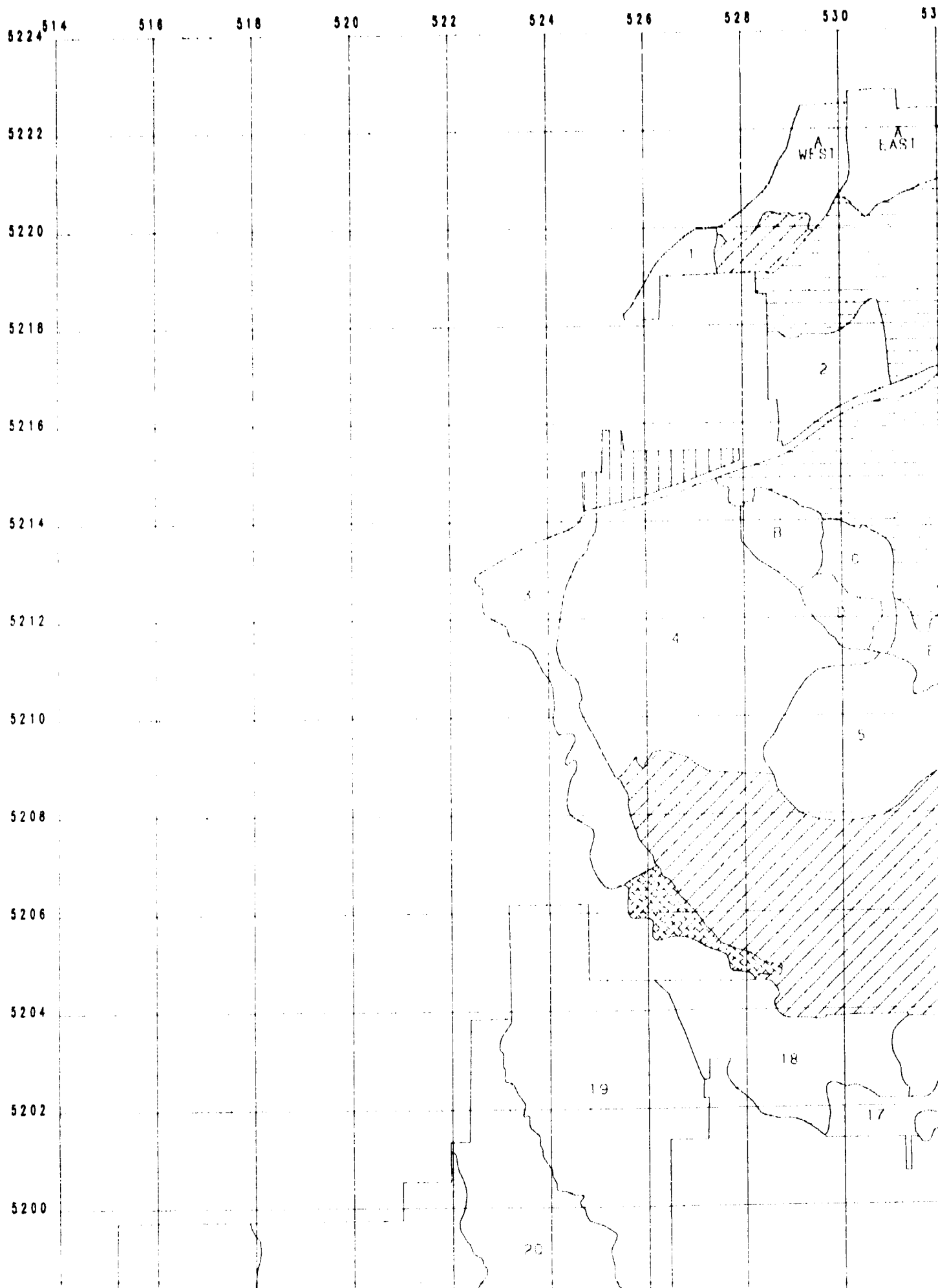
U - URBAN

FT LEWIS, WASHINGTON

N

METERS

0 2000 4000 6000



528

530

532

534

536

538

540

542

544

546

548

WEST

EAST

2

8

9

10

11

15

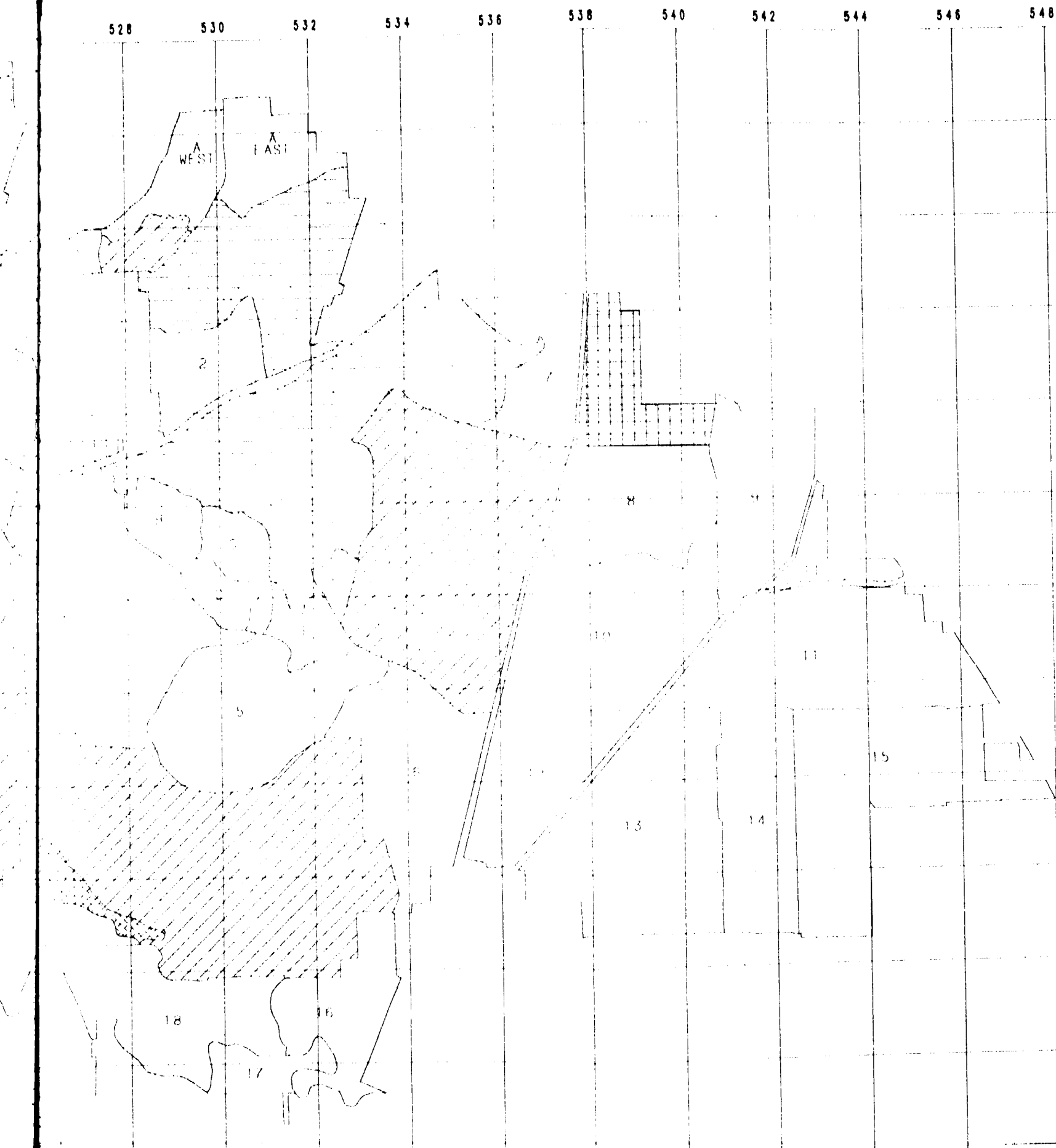
13

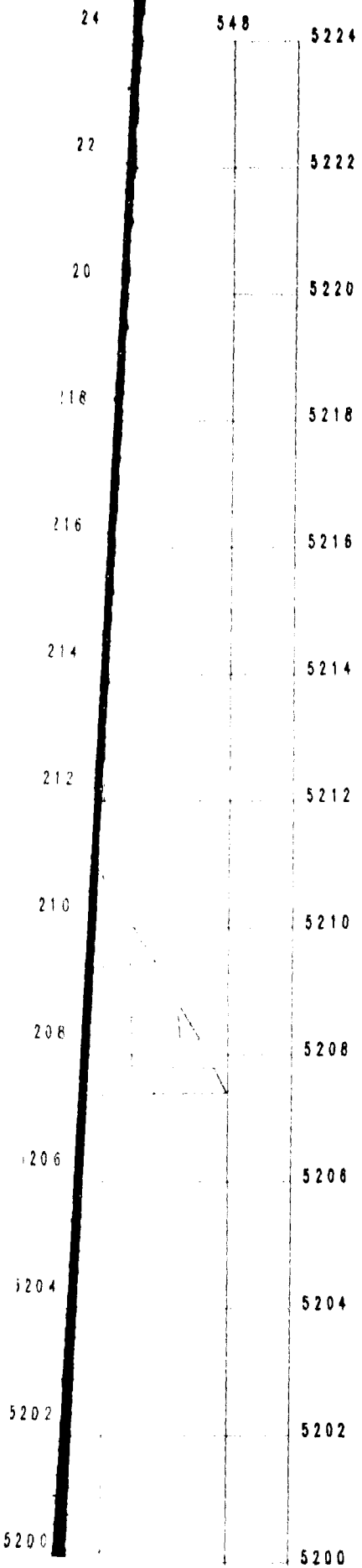
14

18

16

17

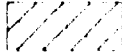

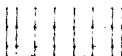
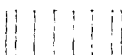
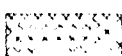
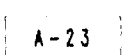




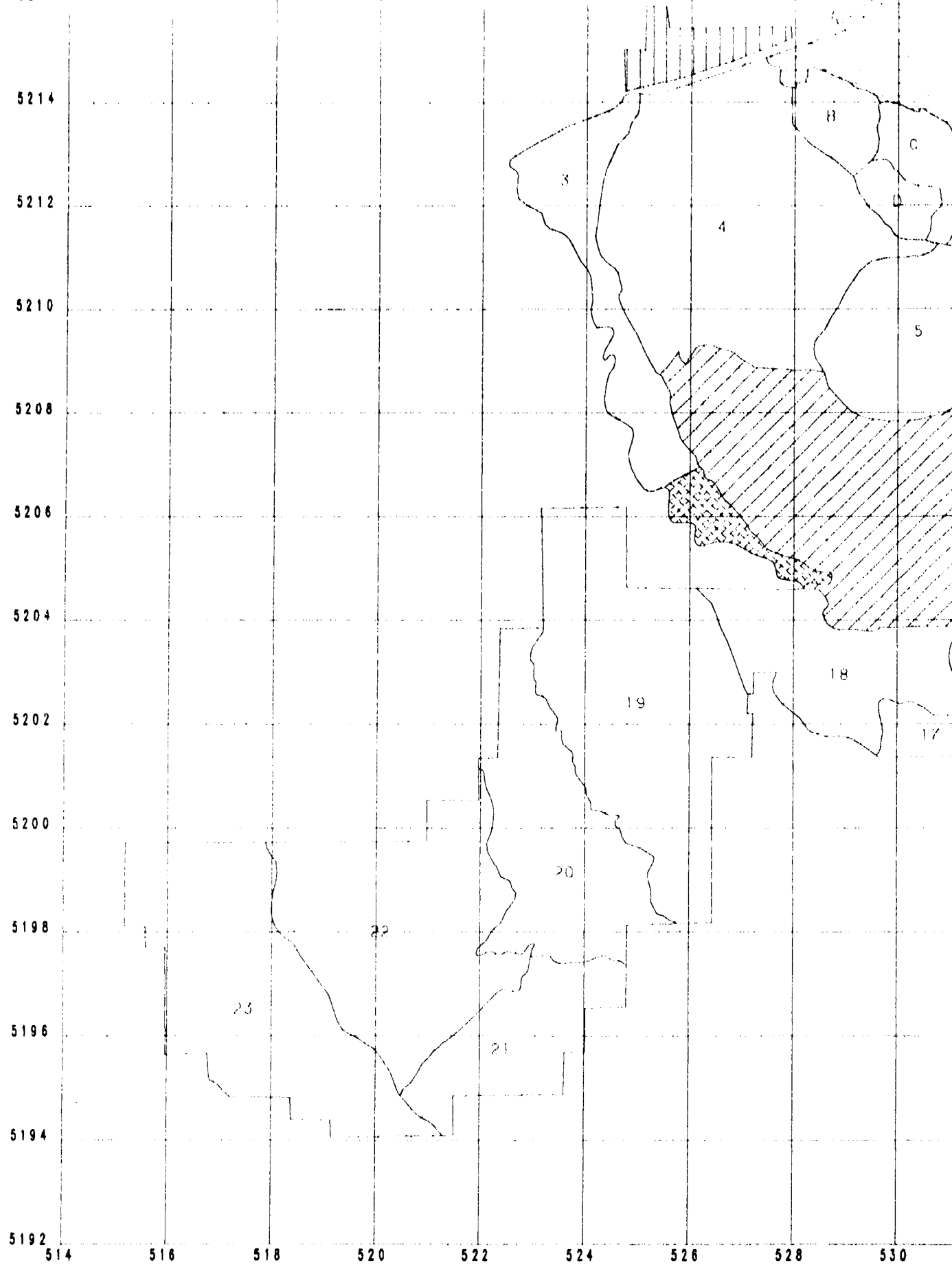
U. S. Army Corps of Engineers Waterways Experiment Station

TRAINING AREA/IMPACT AREA

SCALE 1:100000

- | | |
|--|---------------|
|  | IMPACT AREAS |
|  | CANTONMENT |
|  | AMMO STORAGE |
|  | GOLF COURSE |
|  | BUFFER ZONE |
|  | TRAINING AREA |

FT LEWIS, WASHINGTON



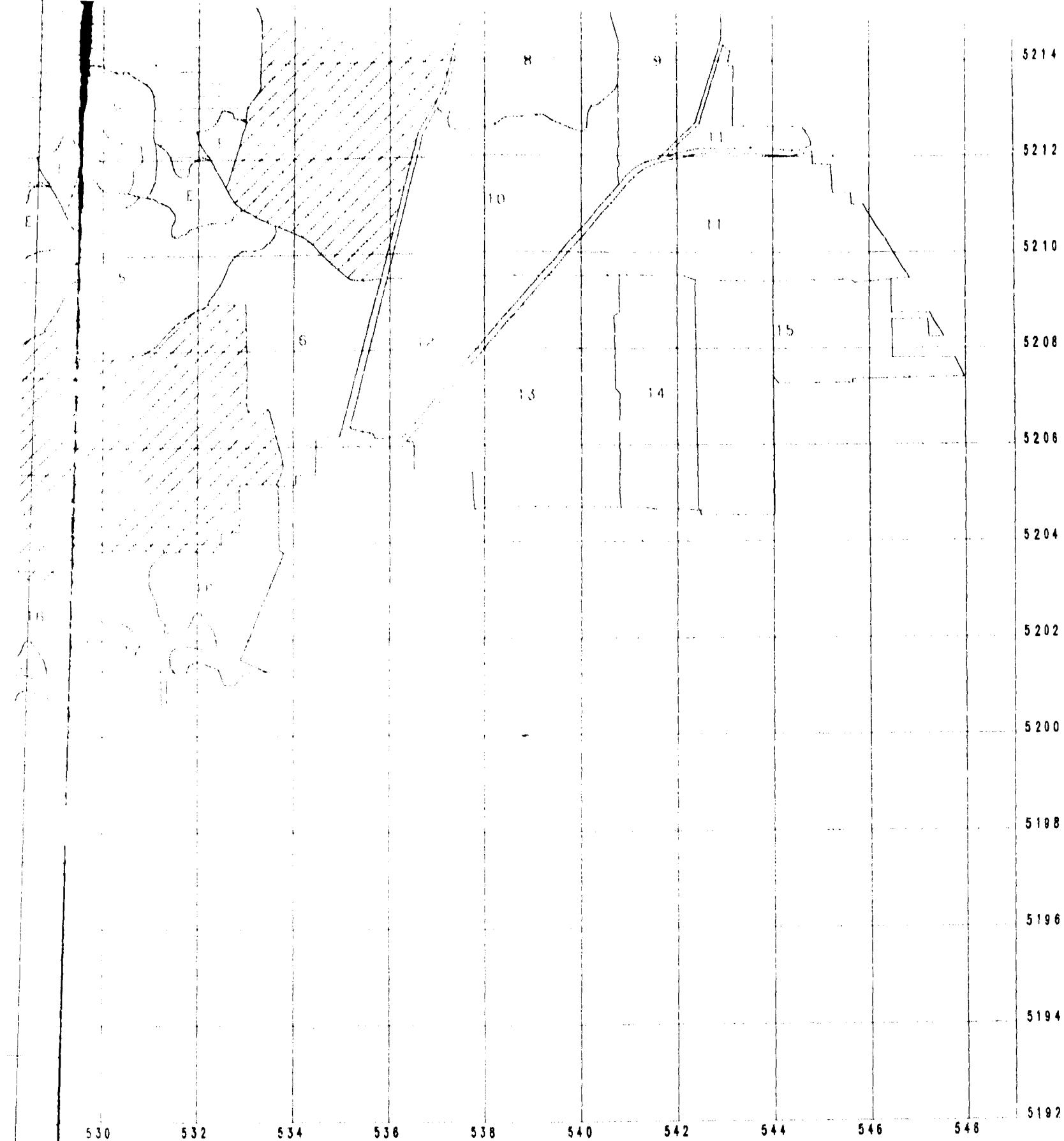


Plate 61. Training areas and other administrative boundaries

5214

5212

5210

5208

5206

5204

5202

5200

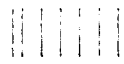
5198

5196

5194

5192

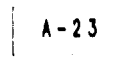
548



GOLF COURSE

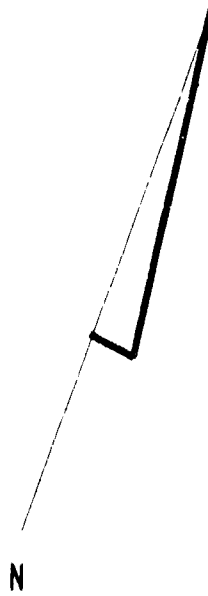


BUFFER ZONE

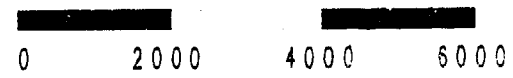


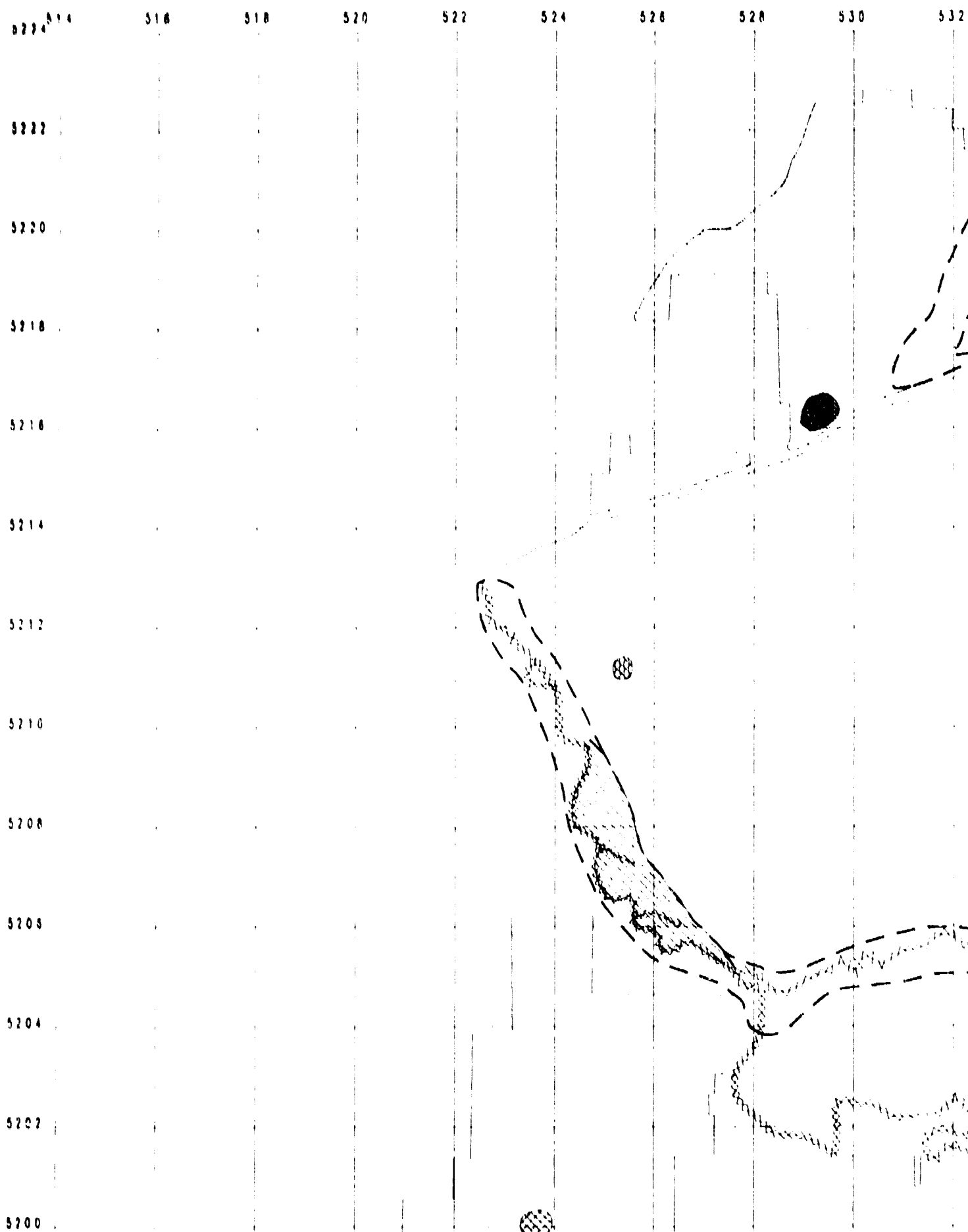
TRAINING AREA

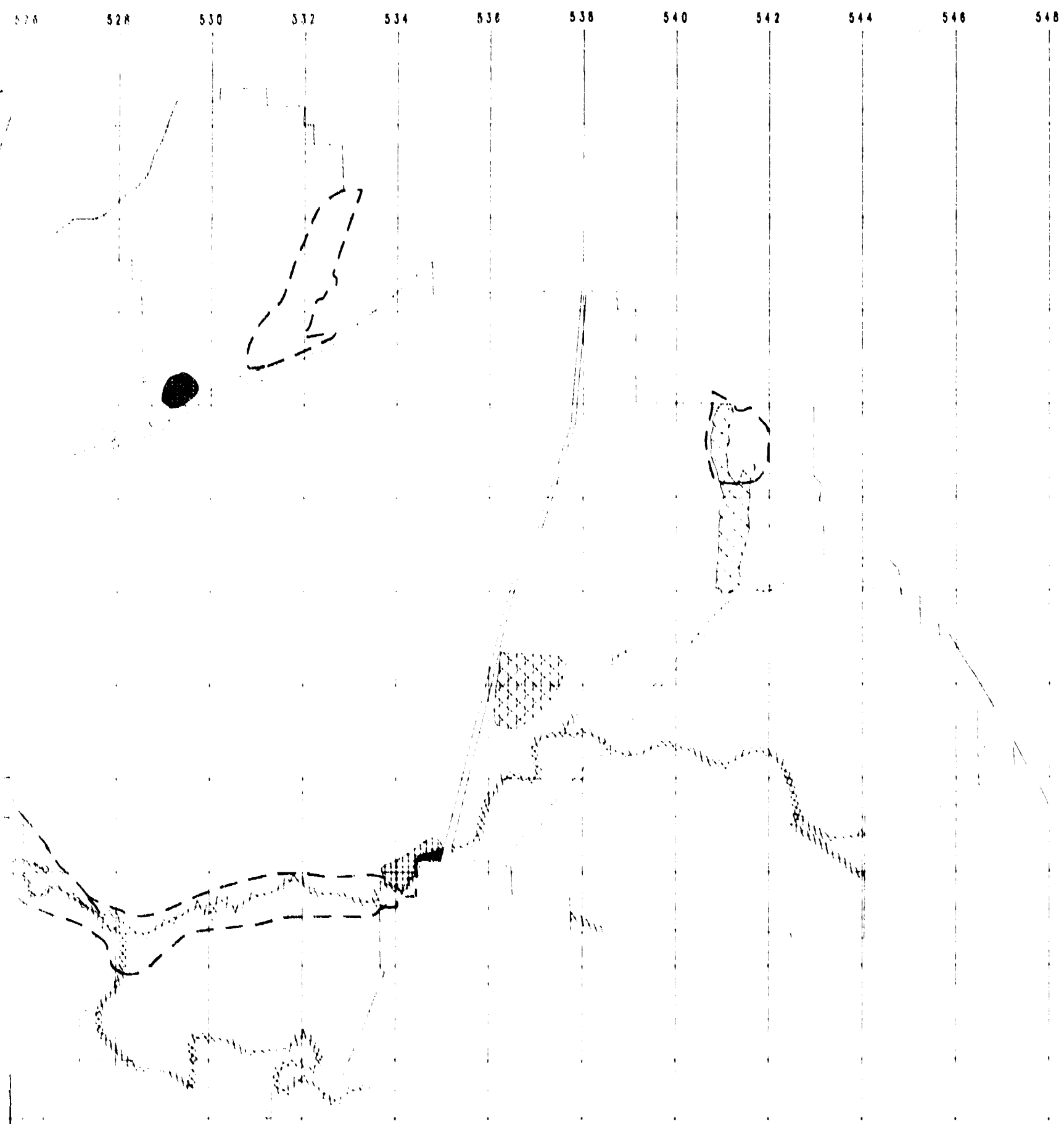
FT LEWIS, WASHINGTON



METERS







546

548

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202

5200

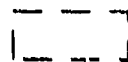


U. S. Army Corps of Engineers
Waterways
Experiment
Station

NATURAL RESOURCE - AREAS OF CONCERN

SCALE 1:100000

ANIMALS



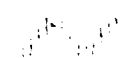
NESTING/WINTERING AREAS
(BALD EAGLE)



HERON ROOKERY

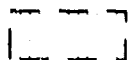


OSPREY NESTING AREA

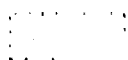


ANADROMOUS FISH SPAWNING AREAS

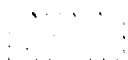
PLANTS



WEIR PRAIRIE AREA



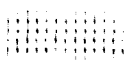
SPURGEON CREEK AREA



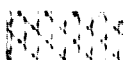
CARTER WOODS AREA



MONETTE HILL AREA



HALVERSON/BRANDENBURG
MARSH AREA



BOWER WOODS AREA



SPANAWAY MARSH AREA

FT LEWIS, WASHINGTON

5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

5194

5192

514

516

518

520

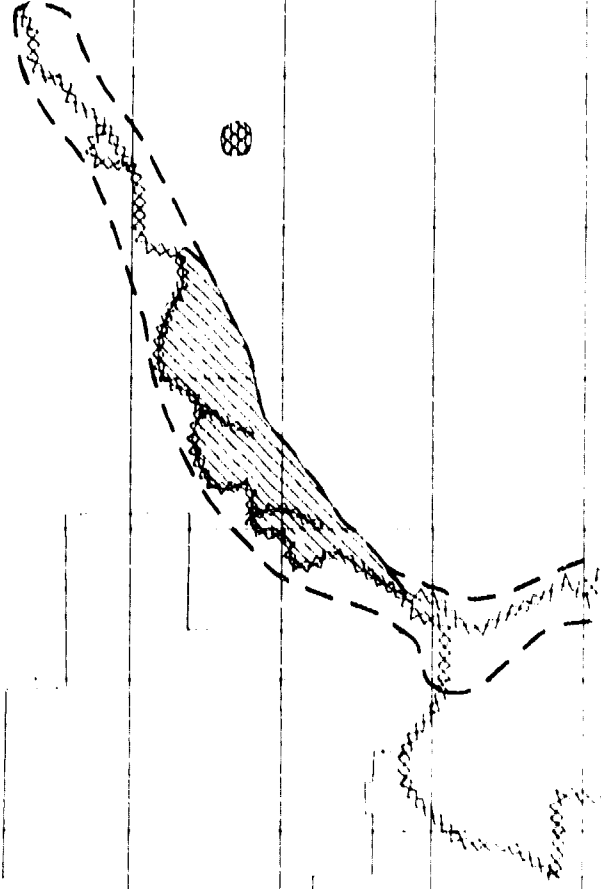
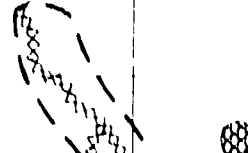
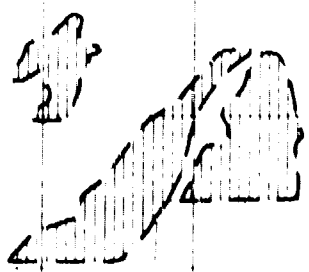
522

524

526

528

530



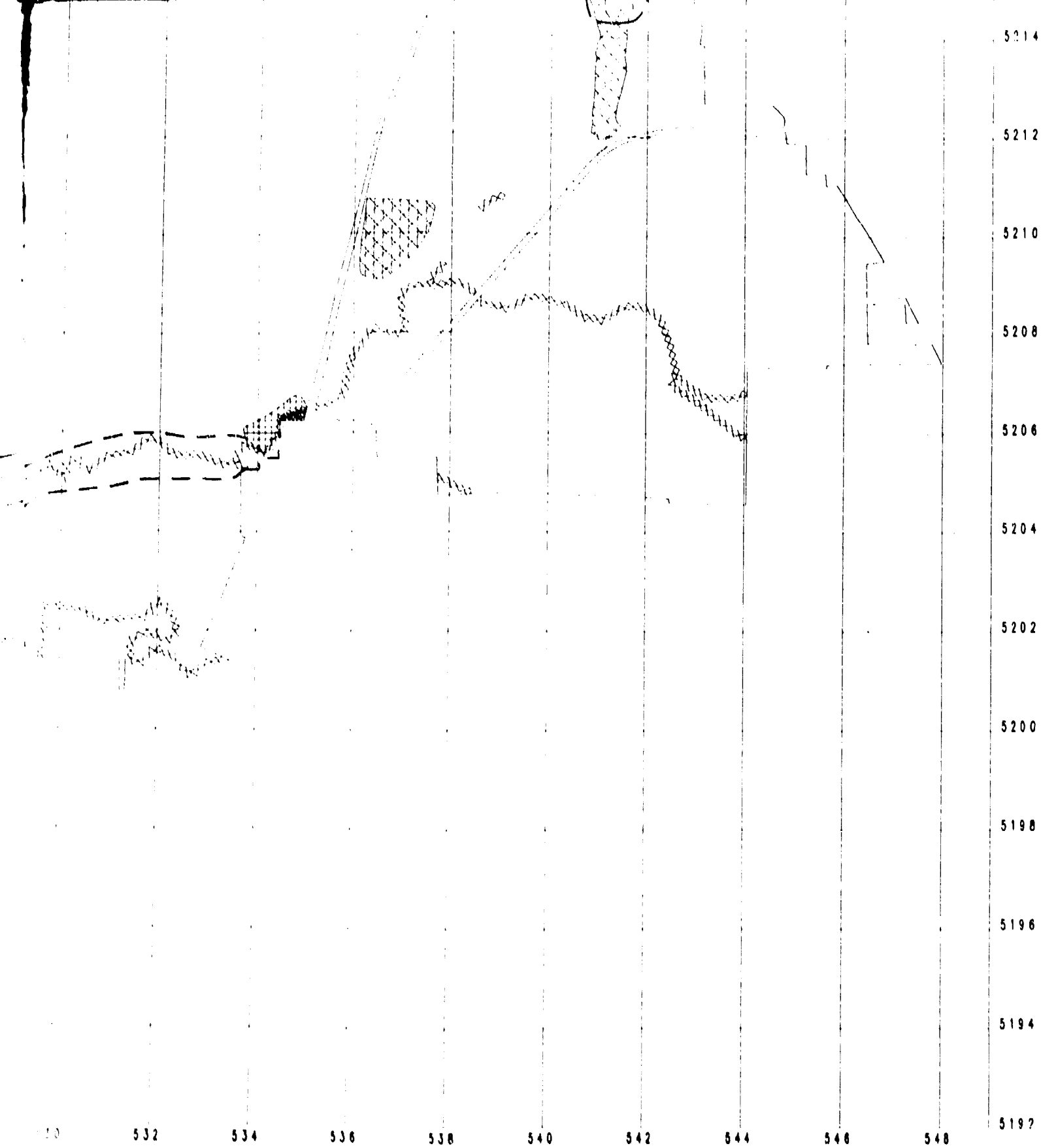


Plate 62. Special features

5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

5194

5192

546

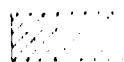
548

ANADROMOUS FISH SPAWNING AREAS

PLANTS



WEIR PRAIRIE AREA



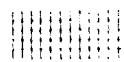
SPURGEON CREEK AREA



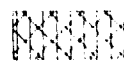
CARTER WOODS AREA



MONETTE HILL AREA



HALVERSON/BRANDENBURG
MARSH AREA



BOWER WOODS AREA



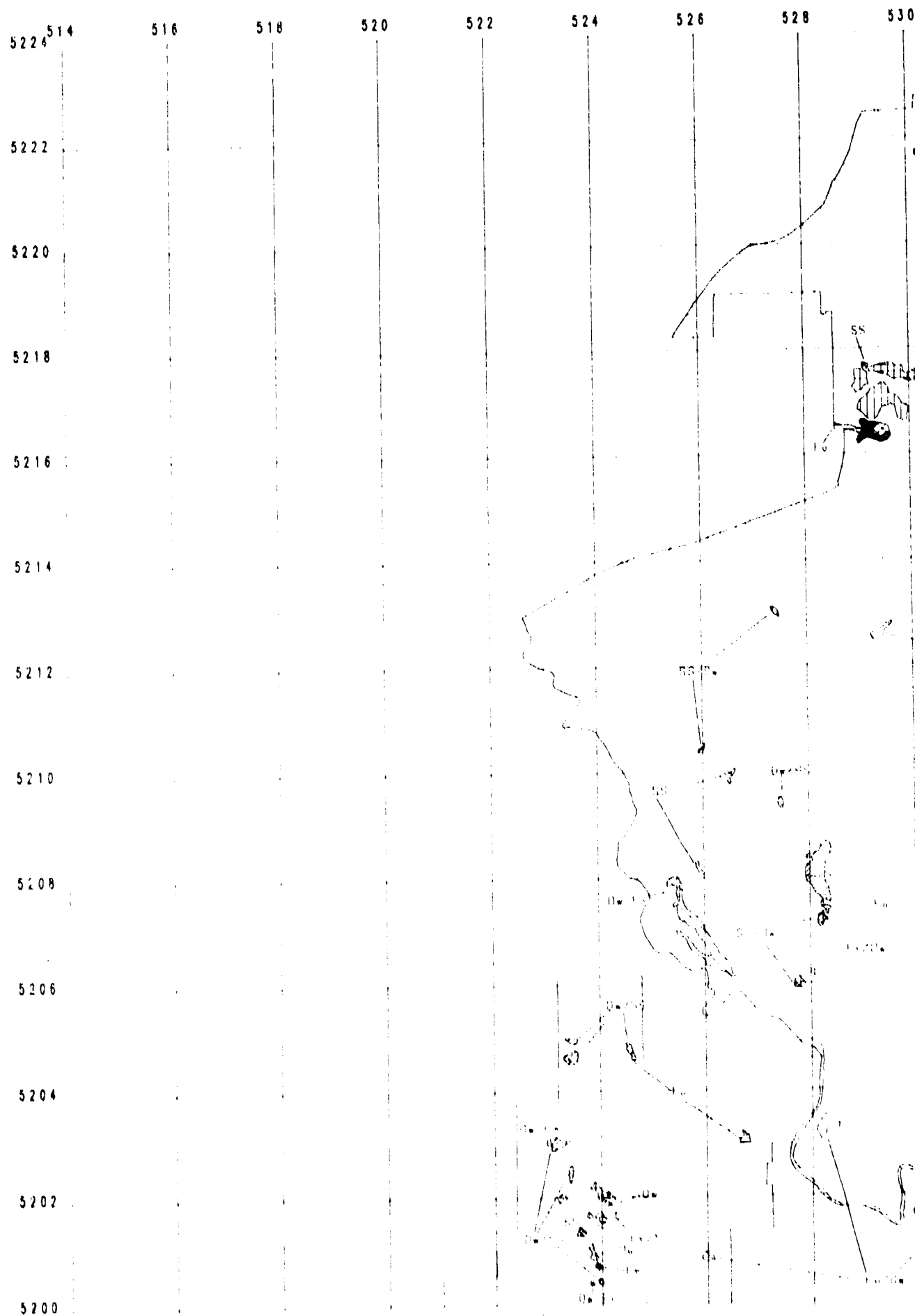
SPANAWAY MARSH AREA

FT LEWIS, WASHINGTON

N

METERS





32

18

530

532

534

536

538

540

542

544

546

548

5224

5222

5220

5218

5216

5214

5212

5210

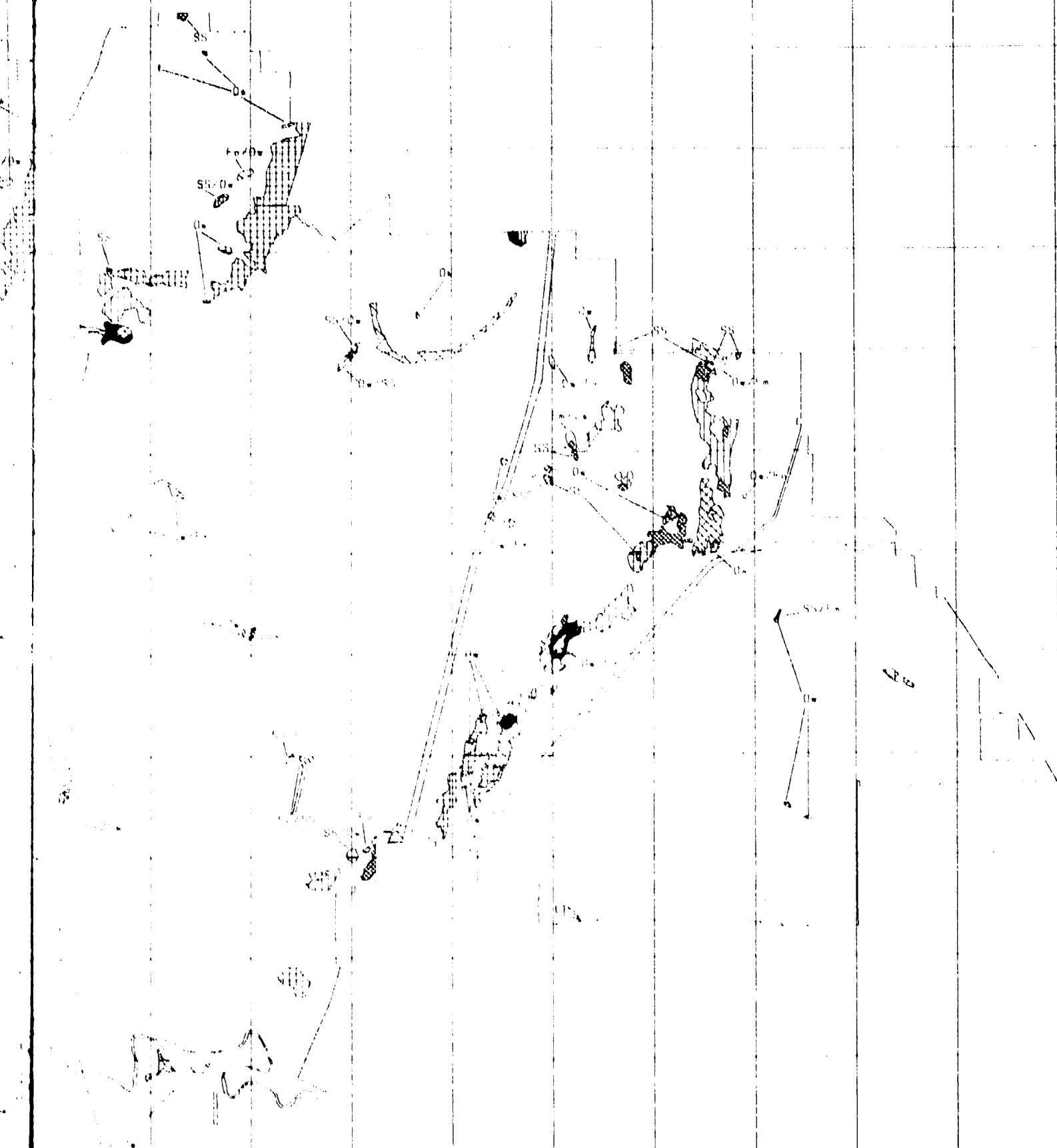
5208

5206

5204

5202

5200



546

548

5224

5222

5220

5218

5216

5214

5212

5210

5208

5206

5204

5202



U. S. Army Corps of Engineers Waterways Experiment Station

WETLANDS

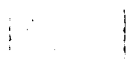
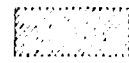
SCALE 1:100000



Em - EMERGENT MARSH



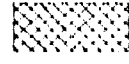
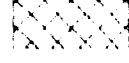
Ow - OPEN WATER

Em/Fc - EMERGENT MARSH/
CONIFEROUS FORESTOw/Em - OPEN WATER/
EMERGENT MARSHEm/Fo - EMERGENT MARSH/
FORESTED SWAMPOw/Fo - OPEN WATER/
FORESTED SWAMPEm/Ow - EMERGENT MARSH/
OPEN WATEROw/SS - OPEN WATER/
SCRUB/SHRUB SWAMPEm/SS - EMERGENT MARSH/
SCRUB/SHRUB SWAMP

SS - SCRUB/SHRUB SWAMP



Fo - FORESTED SWAMP

SS/Em - SCRUB/SHRUB SWAMP
EMERGENT MARSHFo/Fd - FORESTED SWAMP/
DECIDUOUS FORESTSS/Fd - SCRUB/SHRUB SWAMP
DECIDUOUS FORESTFo/Ow - FORESTED SWAMP/
OPEN WATERSS/Fm - SCRUB/SHRUB SWAMP
CONIF/DECID FOREFo/SS - FORESTED SWAMP/
SCRUB/SHRUB SWAMPSS/Fo - SCRUB/SHRUB SWAMP
FORESTED SWAMPSS/Ow - SCRUB/SHRUB SWAMP
OPEN WATER

FT LEWIS, WASHINGTON

5214

5212

5210

5208

5206

5204

5202

5200

5198

5196

5194

5192

514

516

518

520

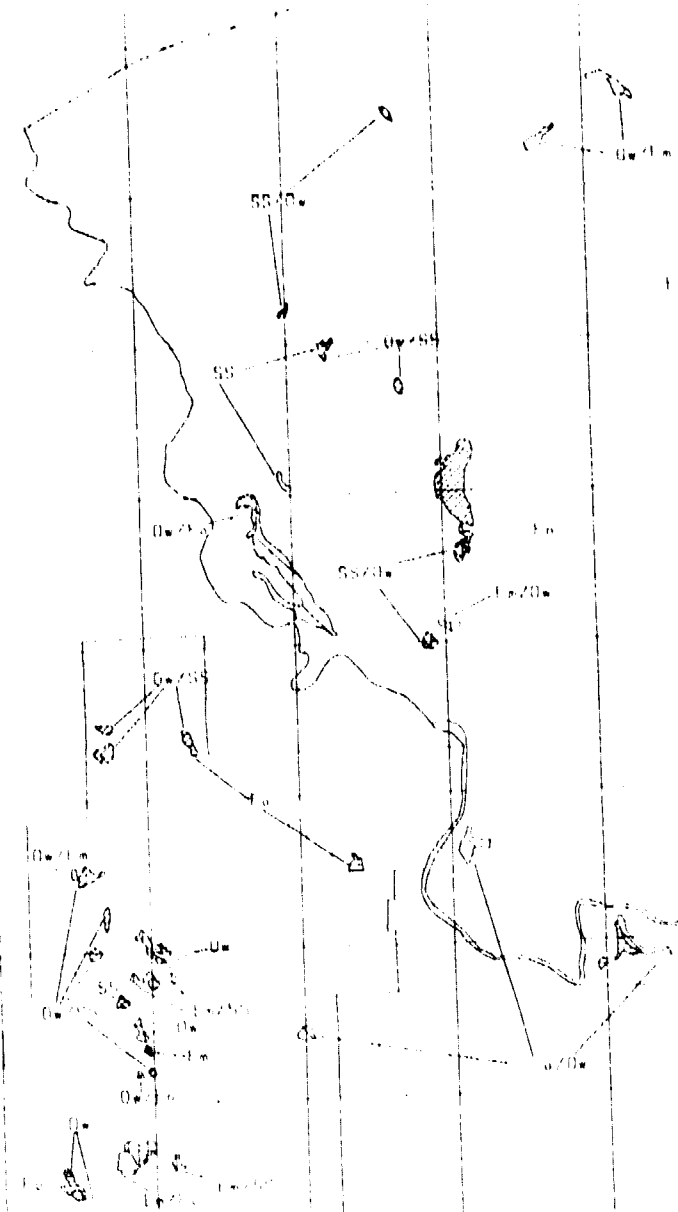
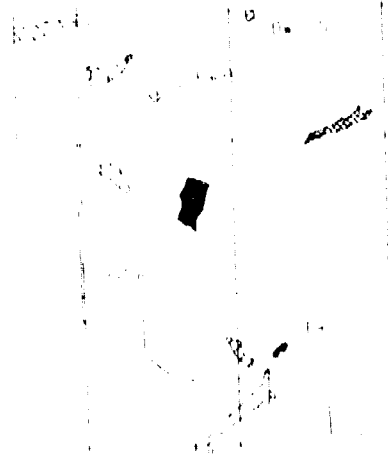
522

524

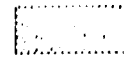
526

528

530



5214

Em/Ow - EMERGENT MARSH/
OPEN WATEROw/SS - OPEN WATER/
SCRUB/SHRUB SWAMPEm/SS - EMERGENT MARSH/
SCRUB/SHRUB SWAMP

SS - SCRUB/SHRUB SWAMP

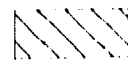
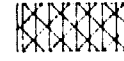
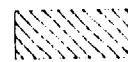
5212



Fo - FORESTED SWAMP

SS/Em - SCRUB/SHRUB SWAMP/
EMERGENT MARSHFo/Fd - FORESTED SWAMP/
DECIDUOUS FORESTSS/Fd - SCRUB/SHRUB SWAMP/
DECIDUOUS FOREST

5210

Fo/Ow - FORESTED SWAMP/
OPEN WATERSS/Fm - SCRUB/SHRUB SWAMP/MIX
CONIF/DECID FORESTFo/SS - FORESTED SWAMP/
SCRUB/SHRUB SWAMPSS/Fo - SCRUB/SHRUB SWAMP/
FORESTED SWAMP

5208

SS/Ow - SCRUB/SHRUB SWAMP/
OPEN WATER

5206

FT LEWIS, WASHINGTON

5204

5202

5200

5198

5196

5194

5192

N

METERS

